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Lucerne as Pasture in Western Districts.

RECENT INVESTIGATIONS INTO ESTABLISHING AND GRAZING THE STANDS.

J. N. WHITTET, H.D.A., Agrostologist.

THE early history of lucerne growing in New South Wales shows that the crop was planted solely on rich alluvial flats in districts such as the Hunter River where a satisfactory rainfall (the average annual rainfall for sixty years at West Maitland is 33.99 inches) and good soil conditions were assured. During recent years, however, the drought resistance of lucerne has been demonstrated and more extensive areas are being planted each year for grazing purposes in the comparatively drier districts of the State. These localities have an average annual rainfall of from 17 to 23 inches.

Fig. 1.—Lucerne at Trangie Experiment Farm.
Note the large spreading crowns of the young plants.

The earliest records available of lucerne and its use as feed for stock show that it was first found in the south-east of Central Asia, and from this region it was taken to Greece by the Persians and grown there as food for their horses and cattle when they invaded that country about 490 B.C. As lucerne is a native of Central Asia, there should be no doubt as to its ability to withstand dry conditions.

Fig. 2.—Sown Eight Years ago, and still Provides Good Grazing.
This area of lucerne was sown in 1920, and photographed in September, 1928.

The first record of the introduction of lucerne into New South Wales was in 1806 when Governor King, in reporting on this plant, stated: " Lucerne

is a very useful crop as it yields as many as three cuttings a year." Official returns for the year 1833 show that 2,424 acres of land were under "lucerne, clover, &c." From that time onward the sowing of lucerne became fairly extensive, and in 1927 the statistical records show that in New South Wales 95,103 acres had been cut for hay and 90,678 acres utilised as green feed. These figures evidently do not include many of the extensive areas which have been established in the Riverina and Slopes divisions and used for grazing purposes only.

No Necessity for Heavy Sowings.

Two of the reasons advanced by some pastoralists for not sowing large areas of lucerne are (1) that seed is expensive, and (2) that it is necessary to sow 10 to 12 lb. of seed per acre. That seed goes up in price when the autumn planting season is approaching is admitted, but excellent quality seed is available at very reasonable rates in the off season in many of the seed-producing districts. By purchasing the necessary supplies at such times and carefully storing it, a very considerable saving in cost is effected. Dealing with the other argument, we find from our experience that even in

Fig. 3. -Lucerne at Bathurst Experiment Farm.
Left: Sown through every hoe of the drill. Right: Lucerne sown in drills 2 feet apart.

as dry a district as Trangie, a light seeding of 2 lb. per acre gives excellent results for grazing purposes. Where plants are not crowded together they form large crowns and withstand stocking better than thickly sown plants, as the latter do not develop vigorous, spreading crowns, but invariably remain spindly in nature.

This fact is also borne out by results of trials conducted at Bathurst Experiment Farm to determine the yields of lucerne sown in (1) wide apart *versus* (2) closely sown drills (see Fig. 3). The rates of seeding were (1) 3 lb. seed, and (2) 10 lb. seed per acre. In (1) the drills were 24 inches apart, and in (2) 7 inches apart, the latter being sown through every hoe of the wheat drill. In the wide apart planting the plants formed large crowns, whereas the other method of sowing produced crowded conditions, which are more or less conducive to the production of small crowns. The plants with plenty of room not only gave greater yields per acre, but, in addition, made earlier growth at all times of the year than the other section; the results covering a period of four years show that the widely

spaced plants produced an average increased yield of 53.9 per cent. per annum. Moreover, when we calculate the number of seeds a pound of lucerne seed contains, it is readily seen that there is no necessity for these heavy sowings, as thickly sown plants are only crowding one another for adequate room and root development. Counts made in our Seed Laboratory show that in 1 oz. of well-cleaned, good-quality lucerne seed there are 12,700 seds, or 203,200 seeds in 1 lb. As a good sample of seed should give a germination of at least 80 per cent., a sowing of 2 lb. of seed per acre will provide, with good distribution, approximately 66 viable seeds per square yard of surface soil.

Optimum Depths at which to Sow Seed.

Lucerne seed, being small, requires to be only lightly covered with soil. If sowing is carried out with the wheat drill or "combine," care should be taken to see that the seed is not buried deeply.

In soil tests that we have conducted for the purpose of ascertaining the optimum depth at which to plant, the following results were obtained:—

DEPTH of Planting Trial.

Seed Planted.	Germination.
*Check plot	85 per cent.
On surface (not covered)	71 ,,
½ inch deep...	81 ,,
1 ,, ...	70 ,,
2 inches deep	54 ,,
3 ,, ...	10 ,,

*This check test was carried out in the Seed Laboratory and represents the results obtained in a seed incubator at a temperature of 30 degrees Centigrade.

Although the figure for surface-sown seed is high, the practice is not recommended, particularly in dry localities, as the seed should be protected from dry conditions and birds by placing it underground; in the case of these tests, a considerable proportion of the surface-sown seed would be forced into the soil when watering. If dry weather were to follow planting, the surface-sown seed would not germinate until heavy rain soaked the surface soil, whereas the seed sown half an inch deep would not only be shielded against outside influences, but would also be in a position to make use of the moisture stored in the fallow, which in most cases would be sufficient to germinate the seed and sustain the early growth of the young plants.

The incubator (check) test was obtained in seven days, and the figures for the soil tests for a similar period are interesting as indicating the rapidity of germination of the shallow-sown seed:—

How Sown.	Germination in Seven Days.
Surface	20 per cent.
½ inch deep...	70 ,,
1 ,, ...	64 ,,
2 inches deep	42 ,,
3 ,, ...	3 ,,

These results denote that, where light sowings of seed are made, it is necessary to use good quality seed, sow on fallowed land, and exercise care in the matter of a shallow planting, in order that the optimum results may be obtained from the quantity of seed sown.

Mix Seed and Superhosphate just Prior to Sowing.

Recent research work carried out in the Seed Laboratory has proved conclusively that seeds of many of our crops are detrimentally affected by superphosphate unless sowing is completed soon after mixing.

The following figures indicate that lucerne seed should not be mixed with fertiliser for long periods before being sown. The superphosphate used was obtained from the fertiliser works three months prior to conducting the tests.

GERMINATION Tests with Good Quality Seed.

Seed Treatment.	Germination.
Check sowing (lucerne seed not mixed with superphosphate)	92 per cent.
Lucerne seed mixed with superphosphate six days prior to sowing	71 ,,

A diminution in the germinating power of lucerne seed begins in from thirty-six to forty-eight hours after being mixed with the fertiliser.

That inferior quality seed is affected by superphosphate to a greater extent than seed of good vitality is shown in the following table:—

GERMINATION Tests with Inferior Quality Seed.

Seed Treatment.	Germination.
Check sowing (lucerne seed not mixed with superphosphate)	69 per cent.
Lucerne seed mixed with superphosphate—	
1 hour prior to sowing	69 ,,
6 hours ,, ,, ...	69 ,,
24 ,, ,, ...	68 ,,
48 ,, ,, ...	64 ,,
4 days ,, ,, ...	55 ,,
5 ,, ,, ...	38 ,,
6 ,, ,, ...	36 ,,

The above tables point to the advisability of mixing the seed just prior to sowing, and not, as is often done by farmers, some days before it is required. Should rain hold up sowing operations, the seed, having been mixed some time before planting, would have its vitality further impaired.

Sowing the Seed.

The usual method adopted in sowing seed on large areas is to use the wheat drill or the "combine," while on small areas a hand broadcasting machine is operated or the seed is scattered by hand. Whichever method

is adopted, it is essential that the seed be thoroughly, but lightly, covered with soil. If a grass seed box is attached to the drill, sow the lucerne seed through that attachment, allowing the seed to scatter in front of the hoes or discs of the drill; a light harrow, wire-netting, chain, or bushes attached to the footboard of the drill will effectively cover the seed.

Where the seed is mixed with superphosphate (use 56 lb. of the fertiliser per acre) and sown through the fertiliser box of the drill or "combine," pull the distributing tubes out of the "feet" of the machine, allowing the mixture of seed and fertiliser to fall on the surface of the ground. If necessary, use a harrow or adopt other means of covering the seed. In cases where lucerne seed is being sown with the last crop of wheat or oats to be grown, and a grass-seed box is not available, mix the lucerne seed with superphosphate and sow through the fertiliser box. Make a very light sowing of wheat or oats as the cereal tends to crowd out the lucerne. As shallow a sowing as possible should be aimed at, as deep planting is detrimental to lucerne seed. In some cases two plantings are made, the wheat being sown first at the usual depth for such seed and the lucerne planted shallower at the second drilling. Where the wheels of the drill or "combine" do not sink too deeply into the prepared land, the distributing tubes can be left in the "feet" of the hoes or discs, provided the latter just penetrate the soil; put the machine into gear by setting the gear lever in the first notch, or allow it to run free between the "in" and "out"

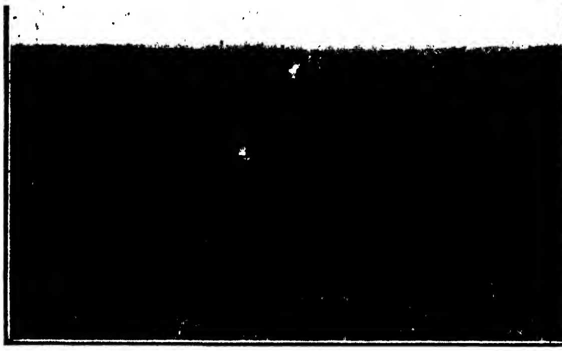

Fig. 4.—A Weed-infested Lucerne Stand.
Roly Poly and Barley grass were very plentiful. The area was planted only twelve months before this photograph was taken.

Fig. 5.—The Same Paddock two Years Later.
Note that there is practically no Roly Poly present.

of gear notches. This will give just sufficient penetration of the soil to satisfactorily cover the seed. When seed and superphosphate mixed are being sown, only put a small quantity of the mixture in the fertiliser box at a time, as this ensures a more even distribution of the seed over the area to be planted.

On friable, self-mulching soil, lucerne is being established satisfactorily for pasture purposes by broadcasting the seed per medium of top-dressing machines, harrows following to give effective covering, or sheep may be used to lightly tramp the seed into the ground. In some cases the land is given a shallow cultivation prior to seeding.

Time to Sow, and what Varieties to Use.

Autumn sowing is recommended if conditions are favourable, but in many cases later plantings have to be made owing to lack of rainfall. The land should be fallowed and seed should be on hand ready for a start to be made in March. In some years at Trangie we have had to wait until the end of July for favourable sowing conditions. Sowing later than this time is risky, owing to the approach of hot, dry weather, and it would then be advisable to defer sowing until the following year.

With autumn sowings the plants become well established during the cooler months of the year, and although they may not make profuse top growth during that period the root development is extensive, and the lucerne is consequently well fitted to withstand the dry conditions generally experienced during the ensuing summer months.

The Department has conducted trials for many years past with varieties and strains of lucerne imported from all parts of the world, but, up to the present time, we have found that our acclimatised local strains give best results, and especially so from the point of view of drought resistance. Intending growers should endeavour to procure their seed from a seed-producing district where climatic conditions are similar to their particular locality.

Feeding-off Lucerne Stands.

After the plants have made 9 to 10 inches of top growth, the area can be fed-off. Such feeding-off should be done by stocking at the rate of eight to ten sheep per acre, in order to eat the growth off rapidly. Remove the animals as soon as the feed becomes somewhat short, otherwise they are likely to graze the lucerne too harshly and injure the young crowns of the plants.

Hoven or bloat is likely to occur in sheep and cattle at any time if the animals are hungry when first turned on to the paddock; the trouble is accentuated if the lucerne is wet with rain or dew. Once sheep become accustomed to feeding regularly on lucerne, however, very few deaths occur. A mixed pasture of grasses and lucerne minimises the danger to a considerable extent as a variety of feed is available. Having grass paddocks, to which the sheep have access, adjacent to the lucerne areas will result in a

better balance of feed than where only lucerne is available. This practice considerably reduces the danger of hoven, and also results in the life of the lucerne plants being extended, as the stock are not feeding on them continuously. It is the young, succulent growths of lucerne which cause most losses from hoven, and whenever possible to do so allow the feed to become more mature before grazing it off.

In most of the grazing districts where lucerne is available, we find, in average seasons, a plentiful growth of barley grass (*Hordeum murinum*) during winter and spring months, and some summer grasses during the remainder of the year. Such growth provides a mixture of pasturage and a well-balanced feed, and tends to reduce danger of hoven.

Work carried out during recent years at the Wisconsin Agricultural Experiment Station, U.S.A., provides interesting results of research conducted to ascertain the behaviour of carbohydrate and nitrogen compounds, generally regarded as "organic food reserves," and the general utilisation and deposition of such reserves. The type of recovery of growth that followed the different cuttings definitely proved that organic root reserves were limiting factors of growth. Areas cut in the (1) full bloom, and (2) seed stages produced vigorous shoots, and areas cut in the (3) succulent stage (6 to 9 inches high) did likewise following the first two cuttings, but with (3) the subsequent growth was spindly, and weeds soon became prevalent in the stand, thus further reducing the vigour of the lucerne.

Fig. 6.—A Vigorous Growth of Roly Poly in a Twelve Months Old Lucerne Stand.

It was found that the storage of organic food reserves is greatly accelerated and produced in excess during the periods of blossoming and seed formation, and this surplus food is stored in the roots. Frequent cutting in the immature stage retards top development and restricts the plants' ability to elaborate organic food reserves in sufficient quantities to enable the roots to store such reserves for the further development of not only tops, but also roots. If these food reserves in the roots are not replenished, a reduction in the reserve content of the roots occurs and new root and top growth diminish.

Results such as those mentioned above have a very definite bearing on the detrimental practice of more or less continuously grazing the young growth of lucerne.

The correct method of handling the paddocks is to wait until the growth is approaching the flowering stage and then feed it off rapidly by heavily stocking the areas. In dry seasons this procedure will have to be slightly modified, as sufficient rainfall may not occur to bring the growth to the stage mentioned. If continuous feeding of young growth is persisted in, the stand will not maintain its vigour for a lengthy period.

Chemical analyses of lucerne cut for hay at various stages of growth have shown that when the crop is in the bud stage it is richer in ash and protein than at later periods when the amount of crude fibre considerably increases. Fat (ether extract) was found to be fairly constant at all stages. Although frequent cutting stimulates a rapid growth for a few seasons, the plants ultimately become weakened, yields are reduced, and many plants die.

The following table shows the feeding value of lucerne hay at various stages of growth:—

	Stage of Growth.	Ash.	Crude Protein.	Crude Fibre.	Nitrogen, Free Extract.	Fat.
		per cent.	per cent.	per cent.	per cent.	per cent.
Leaves sampled green.	Bud stage ...	11·53	26·58	15·71	43·29	2·88
	One-tenth bloom....	10·88	25·75	16·05	43·99	3·33
	Full bloom ...	10·81	24·14	15·47	46·23	3·34
Stems sampled green.	Bud stage ...	8·84	13·39	37·84	38·44	1·48
	One-tenth bloom...	8·09	12·35	38·48	39·75	1·33
	Full bloom ...	7·48	11·53	40·02	39·70	1·27
Whole plant sampled green.	Bud stage ...	10·45	19·78	25·88	41·61	2·28
	One-tenth bloom....	10·23	18·92	28·00	40·58	2·27
	Full bloom ...	9·56	17·63	28·32	42·15	2·34

Care of Established Fields.

It is advisable to have reasonably small paddocks, and put large numbers of sheep on at a time to eat the area off in at least ten or twelve days. If the paddocks are large, temporary fences that can be erected rapidly and moved easily should be utilised for subdivision purposes. Water can be supplied by means of water carts and troughing. Where sheep are continuously grazing on a paddock of lucerne for lengthy periods, the young shoots are severely eaten back, the crowns become damaged, and the vitality of the plant is considerably impaired. In paddocks that are grazed the surface soil sets hard with tramping, and cultivation should be carried out at least twice a year.

Top-dressings of 1-1½ cwt. superphosphate per acre should be made at least every second year. Apply the fertiliser in July or August, working it in with a cultivator.

The Effect of Grazing Fine-woolled Sheep on Lucerne.

Many breeders of fine-woolled Merinos consider that excessive feeding on succulent plants such as lucerne will result in a coarsening of the wool fibre and the production of a heavily conditioned wool. This problem is being investigated at the present time.

By light sowings and having a proportion of the paddock under natural pasture, the difficulty can be overcome to a considerable extent. Sections of the pasture paddocks which are reasonably free of timber could be worked up and planted, and temporary fences erected until the lucerne is well established.

Converting Old Wheat Paddocks to Lucerne Pasture.

In districts such as the Riverina, wheat paddocks having deep, friable soils, and which are to be left out of crop for six or eight years, are planted with lucerne by including 2 or 3 lb. of seed with the last wheat crop sown. This practice is not as sound as where the land is prepared for sowing lucerne alone, but is adopted by many farmers to lessen the cost of establishing lucerne as a pasture. Provided the season is an average one, good stands are obtained, but in a dry time the results are not as satisfactory as where lucerne is planted without the cereal.

Fig. 7. Lucerne sown with Wheat, Narromine District.
The lucerne plants on the right where grasshoppers thinned out the wheat, are sturdier than those on the left where the wheat is thicker.

In establishing lucerne with the cereal the quantity of wheat or oats planted must be reduced to half the usual amount sown, otherwise the legume will be crowded out.

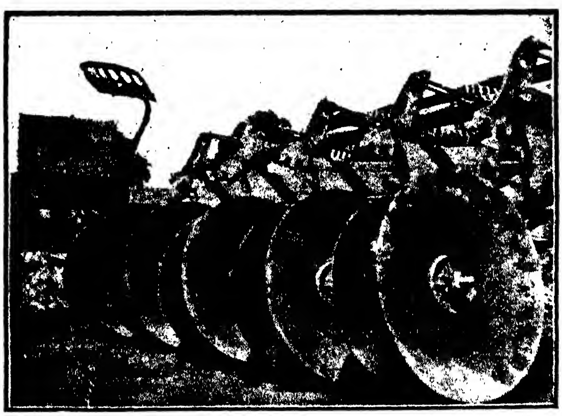

Fig. 8.—A Suitable Type of Disc Cultivator.

Sow Wheat, Oats, or Sudan Grass on Thin Lucerne Stands.

Where lucerne stands have been utilised for grazing for a number of years and are thinning out, an autumn sowing of 20 lb. of wheat or 30 lb. oats, on easily worked land, will provide a considerable quantity of winter grazing during the cereal crop's period of growth of five or six months. The

seed can be sown with the "combine," or the land springtoothed and planted with the wheat drill.

Similarly, if summer feed is required, 8 lb. Sudan grass seed could be planted in September or October.

Cost of Establishing Lucerne at Trangie.

On the red, sandy loams of this and surrounding districts, deep working of the soil is not necessary, a suitable implement to use in preparing the land being a disc cultivator of the type illustrated (Fig. 8), working 3 to 4 inches deep. The land should be worked in October or November to turn under roly poly (*Salsola Kali*) and similar weeds. These are cut up by the

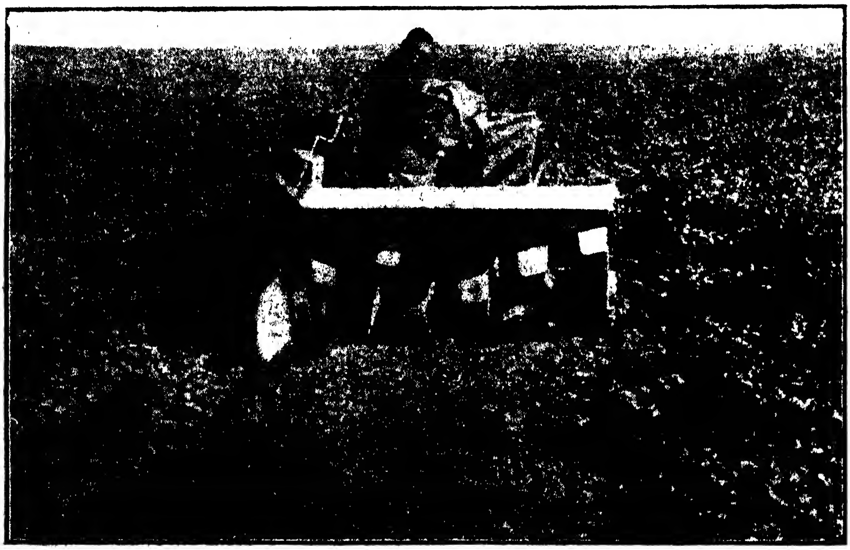

Fig. 9.—A Rotary Hoe.
A useful implement for breaking up land for lucerne and grasses.

cultivator and a certain proportion becomes incorporated in the soil, thus assisting in keeping it from setting hard on the surface. Another working with the cultivator is carried out just prior to sowing. Seed is mixed with superphosphate and sown through the fertiliser box of the drill, using 2 lb. seed and ½ cwt. superphosphate per acre.

Cost per Acre of Establishing Lucerne.

	s.	d.
Two workings with disc cultivator	8	0
Drilling	2	6
Lucerne seed, 2 lb. at 1s. 9d. per lb.	3	6
Superphosphate, ½ cwt.	3	0
Total	17	0

These costs are based on wages at 14s. 2d. per day, and the total cost includes depreciation on machines, horses, &c. If the land is in good order as a result of the first working with the cultivator, the second working and planting of seed could be done with the "combine" and so reduce the cost of establishing the pasture.

A cultivator of the type shown or the rotary hoe is very useful for eradicating Corkscrew or Spear grasses (*Stipa* spp.), and at the same time, on suitable country, is useful for preparing the land prior to establishing lucerne in place of these plants.

Results in the Cowra District.

For many years past we have demonstrated the value of lucerne for grazing purposes on average wheat country at Cowra Experiment Farm, and in good years occasional cuts for hay have also been obtained from such areas.

During the dry summer months very little succulent feed is available on native grass pastures in this district, and at such times the value of lucerne is very evident.

On similar types of hill country at Woodstock, a few miles from Cowra, it is estimated that between 3,000 and 4,000 acres are planted with lucerne and used as pasture.

On an area of 45 acres sown at Cowra Experiment Farm in 1926, the following sheep were carried for the twelve months period, March, 1927, to February, 1928, inclusive:—

Stocking of Lucerne Pasture at Cowra Experiment Farm.

Grazing Period.	Sheep Carried on 45 acres.
1927.—March and April—28 days	450 ewes.
May	Nil.
June—21 days	368 lambing ewes.
September—30 days	368 ewes.
,, 10 days	434 lambs.
October—31 days	366 ewes.
,, 11 days	430 lambs.
November	Nil.
December—31 days	258 lambs.
,, 10 days	435 adult sheep
1928.—January—13 days	204 ,,
February—6 days	204 ,,

As these lambs were well grown it was estimated that two lambs were equivalent to an adult sheep, therefore the paddock of 45 acres carried at the rate of 3.6 sheep per acre for the twelve months' period. The rainfall at Cowra from 1st March, 1927, to 29th February, 1928, was 19.71 inches, only 5.59 inches falling during the first six months of the test. The average carrying capacity of ordinary pasture in this district is three sheep to 2 acres.

Carrying Capacity at Trangie.

In June, 1926, a trial was commenced to determine the carrying capacity of 100 acres of lucerne sown in autumn, 1925. In January, 1928, an additional area of 60 acres, planted in May, 1927, was included in the test:—

Stocking of Lucerne Pasture at Trangie.

Period.	Area.	No. of Sheep.
	acres.	
1926.—June—18 days	100	2,012
July and August	100	Nil.
September—11 days	100	1,307
October—7 days	100	1,257
November—16 days	100	132
December—31 days	100	867
1927.—January—17 days	100	310
February	100	Nil.
March—31 days	100	156
April—September	100	Nil.
October—10 days	100	484
November—16 days	100	484
December—18 days	100	484
1928.—January—28 days	160	460
February—19 days	160	455
March—31 days	160	455
April—30 days	160	455
May—31 days	160	455

The average carrying capacity of the areas in this grazing trial over a period of two years was 2.21 sheep per acre per annum. The carrying capacity of natural pasture in the Trangie district is estimated at from 1½-2 acres to the sheep.

The monthly rainfalls (and totals for each six months) for the period June, 1926, to May, 1928, are shown in the following table:—

1926.	
June	96 pts.
July	54 ,,
August	55 ,,
September	114 ,,
October	17 ,,
November	10 ,,
Total—June to November..	346 ,,
December	148 ,,
1927.	
January	222 ,,
February	8 ,,
March	66 ,,
April	181 ,,
May	22 ,,
Total—December to May...	647 ,,
1927.	
June	56 pts.
July	5 ,,
August	114 ,,
September	180 ,,
October...	107 ,,
November	205 ,,
Total—June to November..	667 ,,
December	140 ,,
1928.	
January	331 ,,
February	624 ,,
March	195 ,,
April	294 ,,
May	33 ,,
Total—December to May...	1,617 ,,
Total for two years ...	32·77 ins.

The fact that only 16.60 inches of rain fell during the first eighteen months of the test shows that from a grazing standpoint the resistance of lucerne to dry conditions is one of its outstanding qualities, the paddock carrying at the rate of 2.07 sheep per acre during this period.

The total area now established at Trangie is 364 acres, the oldest stand being 100 acres sown in 1920, which is still giving very satisfactory results in spite of the fact that it has gone through some very dry years. On this class of country, water (bore) is available only at depths of not less than 200 feet.

Weed Growth and Care of Lucerne Pastures.

Mr. J. A. Williamson, Experimentalist, Trangie Experiment Farm, reports as follows:—

Pasture improvement experiments conducted during recent years at Trangie Experiment Farm by direction of the Agrostologist have definitely indicated the great value of lucerne in any pasture improvement system in districts with similar conditions.

The soil at the experiment farm is a deep, red sandy loam, which has a tendency to set after heavy rain; this tendency is accentuated if the soil is pulverised into a very loose, fine condition. A thorough preparation of the soil as when fallowing for wheat is desirable for lucerne, but it is not always possible to fallow an additional area over and above the amount prepared for the succeeding wheat crop. Hence a short preparation, and, in some instances, only a rough scarifying immediately prior to sowing, is often all that is possible.

The belief that lucerne can only be established during a very favourable season was disproved at this farm during 1927. Without any extensive preparation of the land, 60 acres were sown during the latter part of April with 2 lb. lucerne mixed with 56 lb. superphosphate. The rain recorded during the first four months after sowing only amounted to 197 points, while for the six months including October 484 points were recorded. The adverse conditions were further accentuated by a prolonged succession of hard frosts, which together with the dry cold season, suggested that the sowing would be a complete failure. The lucerne germinated satisfactorily and withstood the adverse conditions remarkably well with the result that an excellent pasture of lucerne is now established. The lucerne plants are the first in the pasture to freshen up and re-shoot after rain, responding immediately to even light falls, and resulting in fair growth in the driest of seasons. The lucerne has often provided the only green pasture during the summer months at this farm.

Weeds may very seriously compete with the lucerne during the first season's growth of the pasture, even to the extent of obscuring from view the presence of the lucerne in the pasture. If a clean pasture and maximum results are desired during the first season, a thorough preparation of the soil, or, in other words, a long bare fallow, is essential.

As a result of observations made at this farm the conclusion has been come to that, after the first season, the lucerne plants are thoroughly established and weeds have little chance of seriously competing with them. During the first season after sowing lucerne for pasture purposes in the autumn of 1925, roly poly made vigorous growth throughout the pasture, and to the casual observer it appeared as if the weeds would choke out the lucerne. This did not prove to be the case; the lucerne, while growing slowly the first season, had formed excellent crowns by the following spring (1926), and the weeds which had been very noticeable the previous season, formed very puny dwarfed plants, which did not appear able to compete seriously with the lucerne.

Grazing Lucerne in other Parts of the West.

In the Canowindra district (average annual rainfall over a period of forty-one years—22.20 inches) lucerne is being grown to a considerable extent on undulating country as well as on the flats. In this locality

approximately 5,000 acres are established, the area on the hills being mainly used for grazing purposes. Messrs. Murray and Hewitt, of "Colensville," have 700 acres of lucerne, the majority of which is on undulating country. In October, 1927, 2,600 hoggets were put on the 700 acres and remained there until March, 1928. During April, 1,200 lambing ewes were grazed on half the area, the remaining 350 acres being closed in order to produce growth on which to lamb the 1,200 ewes during May.

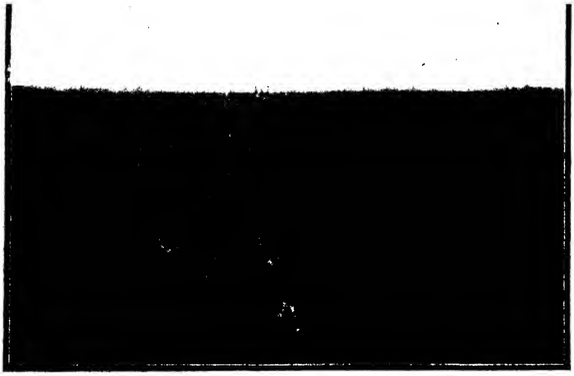

Fig. 10.—Lucerne on Mr. T. R. Millar's Property, "Rallima," Narromine.
The lucerne was planted in 1918; photographed in September, 1928.

Mr. H. K. Nock, of Nelungaloo (average annual rainfall at Parkes for thirty-five years—21.15 inches), has excellent stands of grazing lucerne which were established in 1922, and have carried at the rate of two to three sheep per acre in most years since that time. Occasional plants have run to seed with the result that the stands have thickened up considerably. Typical wheat country on the top of a hill is producing an excellent growth of lucerne for grazing. Lucerne, even on this class of country, is more satisfactory than Subterranean clover.

Fig. 11.—Lucerne Root Development.
Twelve-months-old lucerne plants at Trangie Experiment Farm.

During the autumn and early winter of 1928, Mr. Nock established a further 200 acres of lucerne, using from 3 to 4 lb. of seed per acre. Good quality seed was used and the germination from this seeding was very satisfactory.

Mr. T. R. Millar, Rallima, Narromine (average annual rainfall over a period of thirty-five years—18.49 inches), has 100 acres of lucerne which were planted in 1918 and are still in excellent condition (see Fig. 10). Large numbers of sheep are grazed annually on the area, and in good years several cuts of hay have been obtained. The country is good quality wheat land

and typical of large areas in this district. The lucerne has been well cultivated and top-dressed practically every year, using 100 lb. superphosphate per acre. This area provides an excellent object lesson of what can be accomplished with lucerne by care and judicious stocking in a district with a light rainfall.

Mr. Neil McLeod, Inverness, Wellington (average annual rainfall for forty-six years—22.79 inches) planted 100 acres of lucerne on white granite country during 1923 and 1924. This class of land is not as productive as the red loams of this district, but serves to illustrate its value for lucerne production. In good seasons a couple of cuts are taken off for hay, and the

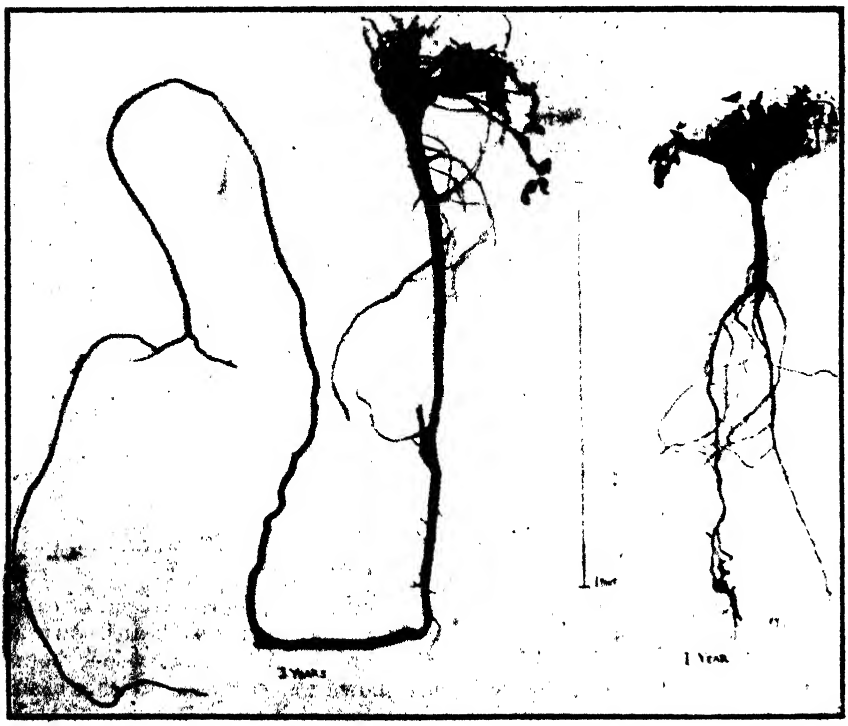

Fig. 12.—Root Development of 3-year old Lucerne Plants, Trangie Experiment Farm.

area grazed for the remainder of the year. A striking example of the value of top-dressing with 1 cwt. of superphosphate per acre was seen in September, 1928. Only 40 acres of the 100-acre paddock was top-dressed and the treated area was grazed by the stock in preference to the unmanured lucerne.

Root Development of Lucerne.

Figures 11 and 12 show the strong, healthy root system of 1- and 3-year old plants grown on the red, sandy loam at Trangie Experiment Farm. To obtain the 3-year old plant, a hole 6 feet deep was dug, and even at that

depth the taproot was approximately ⅛ inch in diameter. The main roots of the 12-months old plants were sturdy at 2 feet deep, their extremities being similar in size to the end of the older plant.

Root development such as this clearly indicates the depths to which the plants will descend in friable soil in search of food and moisture. This type of growth enables lucerne to withstand dry conditions and to respond rapidly to any rain that falls.

Grazing Trials with Summer Legumes.

The following summer legumes were included in last year's grazing trials at Wollongbar Experiment Farm:—Soybeans (Otootan), cowpeas (Cream, Monetta, and Black), dolichos beans, velvet beans (Bush and White Seeded Stringless), petani beans, and gotani beans. This is the second year of this trial

It was unfortunate that, after having the land prepared for the sowing of this experiment in November, rains occurred which prevented planting and "washed" the paddock rather badly. On this account the experiment was not sown till 28th January, 1928. Considering the lateness of the planting, the germination and growth were quite good.

The weights of green fodders as at 11th April, 1928, were as follows:—

	tons.	cwt.
Velvet beans	5	13
Cowpeas	5	11
Soybeans	5	6
Dolichos beans	5	4
Gotani beans	3	15
Petani beans	3	6

After the weights were taken, on 11th April, 1928, fourteen head of cattle were turned in to graze. When first turned in, they took to soybeans, cowpeas, dolichos beans, and velvet beans in that order. After twenty-four hours' grazing, the apparent order of preference shown was cowpeas, dolichos beans, velvet beans, soybeans, petani beans, and gotani beans. The gotani beans were a very bad last, being obviously unpalatable to the cattle.

On 10th May, 1928, observations were made as to the relative recuperative qualities of the various legumes. This is an important point to consider in grazing crops. The best recuperating sorts were dolichos, velvet beans, and Black cowpeas in that order, petani beans also showing a fair amount of growth, but this legume is more suited for green manure than for grazing.

Another grazing was carried out on 18th May, 1928. This grazing showed in favour of dolichos , velvet beans, and Black cowpeas. These three proved the most suitable for grazing purposes of all the legumes tried at Wollongbar Experiment Farm this season. They make possible the cheap and easy production of crops rich in protein.—S. C. Hodgson, Experimentalist, Wollongbar Experiment Farm.

Field Experiments With Silage Crops.

FIVE YEARS' TRIALS AT TRANGIE EXPERIMENT FARM, 1924–28.

J. A. WILLIAMSON, H.D.A., Experimentalist.

FIELD trials to determine the most suitable crop variety for ensilage purposes in the Trangie district were inaugurated in 1924, and have been continued during the past five years. In the early years of the experiment varieties of the main cereals (wheat, oats, barley, and rye) were included, but of recent years the trials have been confined chiefly to oats, owing to the proved superiority of that cereal over wheat, barley, and rye.

In the Trangie district the rainfall experienced during the cooler portion of an average year (that is, from April to October inclusive) results in the production of abundant fodder in the form of the various trefoils, crowfoots, and barley grass; consequently the sowing of crops for fodder purposes is not generally necessary. The growing of crops for silage, however, should occupy a definite place in the general farm practice, and would result in a gradual accumulation of fodder. In average and good years the abundant growth from these crops could be conserved as silage at very little cost, while in a dry season such as 1927 the growth could be utilised as a fodder crop for ewes and lambs, the silage later taking the place of the green growth if the dry conditions continued.

The 1928 Experiment.

The experiment last season (1928) was conducted on soil of a light red loam nature typical of large areas in the district, and which had been fallowed for eight months prior to sowing. The soil was scarified late in July fed off with sheep and cultivated with a springtooth cultivator when necessary to obtain a clean, friable, weed-free seed-bed.

The varieties arranged in triplicate were sown on the 11th April with the exception of Slav rye, which was not sown until the 28th April, due to delay in the arrival of the seed; hence the yield of the rye cannot be used for comparative purposes this season. All plots received an application of superphosphate at the rate of 75 lb. per acre at the time of sowing, while the rate of seeding varied according to the crop and variety.

Germination was uniformly good and all crops responded to the good rains experienced during the latter half of April. The dry conditions experienced during May, June, and early July prevented maximum growth being made, although good yields were obtained as a result of the rains recorded during the latter half of July. The rainfall during the fallowing period amounted to 1926 points, while the total rainfall on the growing crops was 520 points, recorded as follows:—April (rain fell on six days), 254 points; May (three days), 40 points; June (eight days), 59 points; July (seven days), 162 points; August (one day), 5 points.

Harvesting of all crops was carried out on the 27th August, and the results and rates of seedings are indicated in the following table:—

Silage Crop.	Rate of Seeding per acre.	Yield.		
	lb.	tons	cwt.	qr.
Belar oats	49	7	5	2
Sunrise oats	49	6	12	2
Fulghum oats	49	6	11	2
Buddah oats	58	6	6	0¼
Mulga oats	49	6	5	1
Firbank wheat	66	4	8	3¾
Slav rye	66	3	4	3¾

The oat varieties, Belar and Fulghum, are more of a mid-season maturity, and while lacking height when compared with the early maturing varieties, Buddah, Mulga, and Sunrise, their better stooling habit enabled them to form a dense bulk of fodder. In adverse seasons, when the growth is used for fodder purposes, Fulghum and Belar would probably respond quicker to feeding off than would the earlier varieties. The early maturing varieties (Buddah, Mulga, and Sunrise) would, however, be found more suitable by the mixed wheat and sheep farmer for ensilage purposes, as the earlier growth would permit the ensiling to be completed prior to the commencement of hay-making.

The greatest weights of green fodder were obtained from the oat varieties, which again emphasises the superiority of oats for ensilge purposes in this district when compared with wheat.

Five Years' Trials Summarised.

The behaviour of the different crop varieties under the varying seasonal conditions experienced during the past five years is shown in the following table:—

YIELDS for each of the years 1924 to 1928.

Silage Crop.	1924.			1925.			1926. Two cuts.			1926. Total.			1927.			1928.		
	t.	cwt.	qr.	t.	cwt.	qr.	t.	cwt.	qr.	t.	cwt.	qr.	t.	cwt.	qr.	t.	cwt.	qr.
Sunrise oats ...	6	18	3	6	19	3	6	13	2	13	1	0	1	2	2	6	12	2
							6	7	2									
Firbank wheat ...	3	13	0	4	6	0	6	7	1½	11	5	1	0	16	2	4	8	3¾
							4	7	3½									
Barley (Cape and Skinless).	4	8	2	4	15	3	4	1	2	9	19	3	0	16	2	......		
							5	18	1									
Slav rye	5	10	1	6	3	2	3	12	3	7	15	2½	0	18	3	3	4	3¾
							4	3	0½									
Buddah oats ...	... ...			......			8	19	3	14	11	2½	0	19	2	6	6	0½
							5	11	3½									

The rainfall each year during the growing period of the crop was recorded as follows:—

RAINFALL during growing periods, 1924 to 1928.

Month.	1924.	1925.	1926.	1927.	1928.
	points.	points.	points.	points.	points.
April	25	Nil.	349	148	254
May	27	224	210	22	40
June	160	758	96	56	59
July	177	100	54	5	162
August	96	64	55	114	5
September ...	104	69	114	Nil.	Nil.
Total ...	589	1,215	878	345	520

The superiority of oats over wheat, barley, or rye for ensilgae purposes is clearly indicated by the average yield of the different crops for the four years 1924-1927, inclusive, viz.:—

	t.	cwt.	qr.	
Sunrise oats	6	19	3	(100 per cent.)
Slav rye	5	2	0	(73 „)
Firbank wheat	5	0	0	(71 „)
Cape and Skinless barley	5	0	0	(71 „)

Even in an adverse year, such as 1927, when only sufficient growth was made for fodder purposes, the Sunrise oats provided 27 per cent. more fodder than either the Firbank wheat or the barley, while for the five years 1924 to 1928, inclusive, the average yield of Sunrise oats was 6 tons 18 cwt. 3½ qrs. (100 per cent.), or an increase of 30 per cent. compared with the average yield of Firbank wheat of 4 tons 17 cwt. 3½ qrs. (70 per cent.) for the same period.

The early maturing varieties of oats are admirably suitable for early autumn sowing for ensilage purposes. Sunrise oats is considered the standard variety for this purpose in the district, having consistently given excellent results over the past five years. No other variety of oats, with the exception of Buddah, has been included in this trial sufficiently long for comparisons to be made. The average yield of Buddah oats during the past three years was 7 tons 5 cwt. 3 qrs. (105 per cent.), as compared with 6 tons 18 cwt. 2½ qrs. (100 per cent.) which is the yield of Sunrise oats for the same period. The slight superiority of Buddah is not sufficient to recommend this variety in preference to Sunrise as yet.

The general suitability and value of oats to the farmers in the wheat areas, not only for ensilage or fodder purposes, but also as a hay or grain crop, and as a rotation crop to assist in cleaning up wheat diseases, need no reiteration.

CO-OPERATIVE MARKETING ORGANISATIONS IN U.S.A.

THERE are to-day 11,340 co-operatives engaged in marketing the farm products of the growers of the United States. Of this number, 2,479 handle dairy products; 3,455 grain, rice and beans; 1,920 livestock; 1,269 fruit and vegetables, and 125 cotton. There are 862 co-operative stores and 441 unclassified.

Effect of Top-dressed Pasture on Wool.

E. A. ELLIOTT, Sheep and Wool Expert.

WITH the object of determining whether top-dressed pasture affects the quality of wool, the Department is carrying out trials on the properties of Messrs. C. E. Prell, Gundowringa, Crookwell; F. H. Tout & Co., Wambanumba, Young; T. F. Rutledge, Gidleigh, Bungendore; and W. W. Ingrey, Yarraglen, Grenfell.

In each case an even lot of wethers are selected and divided into two batches—one being run on top-dressed pasture and the other on natural pasture. Just prior to shearing each year—the trials will extend over several years—the wethers in each lot are weighed in the wool, and the fleece weights (including bellies) are noted. Samples of wool from the shoulder, side, and breech of each fleece are taken for comparison with wool from the same animals in previous and future years.

The Young, Grenfell, and Bungendore trials were only commenced in the autumn of 1928, and consequently nothing very definite on the special points of the trials will be available till after the next shearing. The trial on Mr. Prell's property at Crookwell, however, has been in progress for a whole year (from one shearing till the next), and reveals some interesting results. In this trial forty young Corriedale-cross wethers carrying a comeback type of wool of an even 60s. quality were selected. After the shearing in November, 1927, the wethers were divided, twenty being kept on natural pasture and twenty on top-dressed pasture for the whole of the twelve months between the 1927 and the 1928 shearings.

The wethers grazed on the untreated pastures were moved into several different paddocks during the year, and the stocking was at the rate of about three sheep to 4 acres. The top-dressed paddock was 50 acres in area, and, in addition to the twenty trial wethers, it carried 200 rams for most of the year, amounting to approximately five sheep to the acre. The paddock had been top-dressed with 1 cwt. superphosphate two years ago and laid down to Subterranean clover and introduced grasses.

The results of the first year's trial at Crookwell are given below:—

Sheep grazed on.	Body weight of sheep.	Fleece weight.	Quality of wool.	Value of wool per lb.	Value of wool per sheep.
	lb.	lb.		d.	s. d.
Natural Pasture	117	12¼	60s.	24	24 3
Top-dressed Pasture ...	137	14	58s.	22	25 8

The wool from the sheep grazed on natural pasture was more attractive than that from sheep on the top-dressed pasture, but the heavier fleece weight in the case of the latter more than compensated for lack of quality. It has also to be taken into account that the top-dressed paddock carried five sheep to the acre, whereas the natural pasture was stocked at the rate of three sheep to 4 acres.

Seed Maize Contests, 1927-28.

Lower North Coast.

J. M. PITT, H.D.A., Senior Agricultural Instructor.

MODERATELY dry conditions prevailed throughout the winter months, accompanied by probably the greatest number of frosts yet recorded during any one season. September and the greater part of October were also dry and cold, but from early November to the end of the growing season the rainfall was well above the average, culminating in severe floods on the Macleay in February, which in some cases destroyed the maize plots and seriously decreased the yield in others. On the Manning the continual rain tended to sour the soil and produce blight and other diseases, and consequently decrease the yields. The season thus, for the main plots at any rate, was not a favourable one.

The rainfall at Taree and Kempsey was as follows:—

	Taree.	Kempsey.
	points.	points.
1927—		
August	18	Nil.
September	94	67
October	225	380
November	813	894
December	555	448
1928—		
January	620	11 inches.
February	359	

The Entries.

This was the seventh annual contest for main varieties on the Macleay. The competition was conducted by the Macleay Agricultural Society, and there were twenty-three entries. The samples sent in for sowing were, with a couple of exceptions, well up to standard, being truly representative of the variety, sound and even. This is an outstanding feature of present-day contests, and no doubt improved yields are directly attributable to the greater care now being taken in the selection of seed. It is particularly noticeable, too, that keen followers of these competitions—farmers who are present at each sowing operation, and are thus afforded an opportunity of closely scrutinising the samples of seed sent along, noting the good and bad points, &c.—are those that send in the best samples, and invariably finish close up in the table of yields. Among the entries were: Fitzroy six, Yellow Hogan five, Golden Beauty three, representing the most popular varieties on the river.

The Manning River District A.H. and I. Association (Taree) conducted its eighth contest. There were twenty-one entries, Fitzroy leading with seven, Pride of Hawkesbury and Large Red Hogan four each, and Manning

Silvermine three. Although good, the Fitzroy entries were not quite up to the standard of previous years. With the exception of about three, the remaining entries showed an admixture of other sorts, caused by cross-fertilisation with other varieties grown in close proximity. Whilst it is admitted these crossed strains have not suffered from the point of view of yield, still the Manning is one of the main sources of seed supply of Fitzroy variety, and it would be a pity for such a prominent variety to lose its identity. Seed supplies are not seriously affected yet, but the tendency requires checking by a more careful selection of seed site and time of sowing.

The Large Red Hogan and Pride of Hawkesbury samples were mostly good. Two samples of Silvermine showed variation or a breaking away from the long, deep, very rough dented original type. This more recent type (in which there is undoubtedly a splash of Manning White or Hickory King) is longer in the cob, smoother in the dent, and whiter in the grain, and is a very heavy yielder. It is also more resistant to fungous diseases, a decided advantage, for this was one of the worst features of the older type.

In the Mount George Agricultural Bureau contest (the fourth) there were fourteen entries, consisting of Fitzroy four, and two each of Golden Beauty, Leaming, and Pride of Hawkesbury. The samples were well up to the average. In this contest a recently imported very early variety—Rumski—was tried out for the first time.

THE MACLEAY CONTEST.

Three plots were chosen for the main trial—Temagog (Mr. John Booth), East Kempsey (Mr. F. Waters), and Smithtown (Mr. D. Duncan).

The Temagog Plot.—This farm had grown maize for very many years, the fertility being kept up by rotating maize with peas, vetches, lucerne, and occasionally a high-level flood would leave a deposit; also by early cultivation, fallowing, &c. The soil was a medium loam. After the removal of last season's maize the land was ploughed early in July, a further ploughing being given late in August. The plot was sown on 6th September, 1927, superphosphate being applied at the rate of one bag to the acre. Germination was uneven, the seed bed being on the dry side. After mid-October very wet conditions prevailed. At one stage the crop became quite yellow on the bottom leaves, caused by sourness of the soil. It was feared the crop would fail, but a short dry spell improved matters, the yield eventually averaging 103 bushels to the acre. On this sweeter class of country the later maturing varieties yielded best, some of the Large Red Hogan and Pride of Hawkesbury topping the 120 bushel mark. Other good yields were recorded by Leaming and Golden Beauty, entered by Messrs. Richardson, Booth, Smith, and Kesby. These varieties suit the Upper Macleay, where they are extensively grown.

The Smithtown Plot.—At Smithtown a comparatively new area was selected by Mr. Duncan—a paspalum paddock broken during 1926, and sown to maize the first year. In preparation for the competition plot, the land

was ploughed in May and again early in September, the plot being sown on 14th September, without fertiliser. Early growth was fairly even. Too much rain, however, prevented after-cultivation, with the result that summer grass grew profusely. During the February floods the backwater reached almost to the crops, the weed growth preventing the crop from lodging. Considering the unfavourable conditions, the average yield of 94 bushels to the acre was remarkably good, and the sample of grain, too, was much better than anticipated. On this heavy class of country, especially when the rainfall has been excessive, very late maturing varieties fail badly. Yellow Hogan and Fitzroy filled eight of the nine leading positions—information that must be valuable for "down the river" farmers. Mr. Dornan's Yellow Hogan "cleared out" from the others with a 10-bushel lead, yielding 115 bushels to the acre.

The East Kempsey Plot.—Mr. Waters selected the same patch as used last year. On this occasion the land was in much better tilth, due to a ploughing in July and quite a number of discings, and a splendid seed bed resulted. Sown in the flush of the season, the germination was good and rapid growth followed, but, as is usual where the growth is not checked, it remained softish. Cobbing was very satisfactory, but the February flood played such havoc that the plot was abandoned.

TABLE of Yields.—Macleay Contest.

Competitor.	Variety.	Temagog Plot. (Mr. J. Booth).		Smithtown Plot. (Mr. D. Duncan).		Average Yield of the Two Plots.	
		bus.	lb.	bus.	lb.	bus.	lb.
E. Dornan	Yellow Hogan ...	115	36	101	53	108	44½
Colin Smith	Leaming	123	50	92	53½	108	23¾
E. H. Ducat	Pride of Hawkesbury	124	10	92	21	108	15½
A. Kesby	Golden Beauty ...	121	45	93	0	107	22½
J. G. Ward	Golden Beauty ...	108	48½	104	41½	106	45
Colin Smith	Yellow Hogan ...	112	6	100	43	106	24½
V. Wright	Fitzroy	109	17½	102	46½	106	4
S. E. Thurgood	Yellow Hogan ...	106	28½	105	27	105	55½
R. Richardson	Golden Beauty ...	121	45	89	40	105	42½
J. G. Stitt	Pride of Hawkesbury	122	15½	88	51½	105	33¼
J. G. Stitt	L. R. Hogan... ...	126	23½	83	38	105	2½
E. E. Booth	Fitzroy	109	33	92	25	101	1
D. J. Wright	Fitzroy	101	36	99	41	100	38½
D. M. Dornan	Yellow Hogan ...	101	53	96	27½	99	12
J. G. Ward	Macleay White ...	103	40	92	53½	98	18½
J. M. Booth	Yellow Hogan ...	108	2½	88	5½	98	4
R. Richardson	L. R. Hogan ...	98	6½	88	55	93	30½
—. Houlihan	Silvermine	98	6½	88	55	93	30½
Department of Agriculture ...	Ulmarra Whitecap ...	90	17	95	11	92	42
J. P. Mooney	Fitzroy	98	23	87	20	92	49½
F. Waters	Fitzroy	84	15	97	51	91	5
P. Waters	Fitzroy	84	39½	95	26	90	4½
T. J. Cooper	Leaming	96	3	72	18½	84	10½
Average Plot Yield		103	16	94	6	....	

Notes on Yields.

The honor of securing first place in the aggregate again fell to the Yellow Hogan variety (Mr. E. Dornan's entry) with 108 bushels to the acre. This performance places Yellow Hogan well in the lead of all varieties in the Macleay contests. The average yield under unfavourable conditions must be regarded as very satisfactory.

The honors in the present contest, however, were very evenly divided between Yellow Hogan, Leaming, and Pride of Hawkesbury, for a difference of only half a bushel separated the first three places, the result being the closest yet recorded. With the late maturing varieties yielding so poorly at Smithtown under very wet conditions, and the same varieties topping the list at Temagog, where the conditions were not quite so bad, we have a striking instance of reversal of form. The Yellow Hogan, Leaming, and Golden Beauty entries were more reliable. Best individual yields were: Large Red Hogan 126 bushels, Pride of Hawkesbury 124 and 122, Leaming 123, Golden Beauty 121, Yellow Hogan 115 and 112.

THE MANNING RIVER CONTEST.

Three plots were chosen for the contest, viz., on the properties of Mr. R. Richardson (Mondrook), Mr. H. M. Singleton, and Mr. J. P. Davis (Taree Estate).

Mr. Richardson's Plot.—A rich alluvial loam, same site as last year's plot. Ploughed May; disced, rolled, and harrowed. Fallowed until early August, ploughed again, and rolled. Top-dressed with 2 cwt. superphosphate. Disc-harrowed twice, and sown on 5th September, 1927.

Mr. Singleton's Plot.—The land was under pasture prior to 1926, and since that time two crops of maize have been grown. Ploughed twice (July and October), sown 14th November, 1927, no fertiliser being used. A prior sowing earlier in the season was cancelled owing to a weak germination.

Taree Estate Plot.—This was Mr. Davis's initial attempt. He is a young farmer and a keen trier. Soil, an alluvial loam. Previous cropping lucerne in 1925, then maize. Ploughed July, rolled, short fallow, harrowed, rolled end August. Fertiliser, 2 cwt. superphosphate broadcasted. Ploughed shallow, rolled, harrowed late September, springtoothed and harrowed. Sown 12th October, along with 1 cwt. superphosphate.

The Yields.

The average yield of 117 bushels per acre at Mr. Richardsons is considerably lower than the previous year's record. Late maturing sorts, Large Red Hogan and Pride of Hawkesbury, filled six of the eight leading positions. The highest individual yields were Pride of Hawkesbury 131 and 125 bushels, Large Red Hogan 124, 124. and 121, Fitzroy 125. At Mr. Singleton's the average plot yield of 88 bushels to the acre was the lowest since the 1922-23 contest. Quite a number of factors contributed towards the comparatively low yield—a late re-sowing, weak germination, damage by wind and rain, and a bad attack of blight, especially in the late maturing sorts.

Yields ranged between 69 and 107 bushels, only four entries exceeding the 100 bushels mark. At Taree Estate the average yield of 123 bushels per acre was the best of the series, the yields ranging between 105 and 139 bushels. Best individual yields were Fitzroy 139 and 134 bushels, Pride of Hawkesbury 134, 133, and 126 bushels, Large Red Hogan 135, Hickory King 126, Manning Silvermine 129. This was a good average plot, although a little more mould and disease were present than at Mondrook.

Mr. Davis, besides winning the trophy for the highest plot, also secured that for the highest average yield, 124 bushels per acre, and as his Fitzroy also put up the highest individual yield (139 bushels 45 lb.), he had the distinction of carrying off the treble—a performance not previously recorded. In addition, he had already won the Royal Agricultural Society's and Kellogg's trophies for No. 2 District, thus securing all the prizes possible during the season—a truly remarkable performance, and one not likely to be repeated. Messrs. Dempsey Bros.' Pride of Hawkesbury secured second place. These varieties are the heaviest yielding strains at present in the district. The yields of Messrs. Drury and Adams' Silvermine caused quite a surprise, as this variety has not been featured so prominently for years. The somewhat unfavourable season and the badly blighted late maturing varieties at Mr. Singleton's caused considerable variation in the places of some of those varieties.

TABLE of Yields.—Manning Contest.

Competitor.	Variety.	Mr. Richardson's Plot.	Mr. Singleton's Plot.	Taree Estate Plot (Mr. Davis).	Average Yield of three plots.
		bus. lb.	bus. lb.	bus. lb.	bus. lb.
J. P. Davis ...	... Fitzroy	125 14	139 45	107 8	124 4
Dempsey Bros.	... Pride of Hawkesbury (No. 2).	131 48½	133 51	100 18	122 2
C. Drury ...	... Manning Silvermine ...	122 46½	125 27	101 11½	116 28
Dempsey Bros.	... Pride of Hawkesbury (No. 1).	113 48	134 53	97 43	115 29
R. Richardson	... Large Red Hogan ...	121 45½	135 30	79 6	112 8
J. Cameron ...	... Dawson's Yellow ...	118 20½	121 48	94 49	111 39
W. T. Macdonald	... Hickory King	110 12½	126 38	96 52½	111 16
W. J. Adams...	... Manning Silvermine ...	109 5½	129 11	94 7½	110 45
Geo. Levick ...	... Large Red Hogan (No. 1)	124 46	126 30	79 39	110 20
H. Nixon ...	... Fitzroy	116 28	112 48	101 20	110 13
Alan Murray	... Fitzroy	109 25	134 53	82 11½	108 48
Geo. Levick ...	... Large Red Hogan (No. 2)	122 2	123 0½	81 27	108 47
J. P. Mooney	... Fitzroy	112 14½	114 52	95 26	107 31
S. Flett ...	... Pride of Hawkesbury ...	125 27	126 22½	68 36½	106 47
D. Dorward ...	... Fitzroy	117 31½	119 18½	81 51	106 15
J. G. Stitt ...	... Large Red Hogan ...	124 48	123 25½	69 38	106 0
F. Flett ...	... Manning Silvermine ...	110 12½	108 15½	96 19½	104 53
R. Richardson	... Golden Beauty... ...	114 6	112 40	81 51	102 51
S. Flett ...	... Fitzroy	112 40	114 52	76 17½	101 18
F. Waters (Kempsey)	Fitzroy	107 8	105 52½	90 9	101 4
J. G. Stitt ...	... Pride of Hawkesbury	108 52½	114 6	73 37	98 51
Average Plot Yield		117 6	88 6	123 5	

MOUNT GEORGE AGRICULTURAL BUREAU CONTEST.

Two plots were selected—Somerset (Mr. C. Shields) and Woodside (Mr. Alex. Andrews).

The Somerset Plot.—Rich alluvial loam, same site as last year's plot. Previous crops, maize and pumpkins. Ploughed and harvested late in April. Ploughed, harrowed, and disced again in August. Ploughed again in September, and disced and harrowed just prior to sowing. The seed bed was in good order. Superphosphate at the rate of 1½ cwt. per acre was sown with seed on 13th October, 1927. Germination was fairly good, and favourable conditions prevailed throughout, but the excessive and continual rainfall caused blight, especially in the late varieties.

The Woodside Plot.—Soil alluvial flat, which had been, for many years, sown with maize alternated with pumpkins. First ploughing given at the end of September; harrowed, and given a second ploughing early in November. The land was in good order for sowing (17th November, 1927). Germination was good, but too much rain and the late sowing caused a bad attack of blight.

Yields.

The average yield at Somerset, 107 bushels per acre, is very good considering the excessive rainfall. Twelve of the fifteen varieties exceeded the 100 bushels mark, Fitzroy filling three of the first four places. Pride of Hawkesbury also yielded fairly well. At Woodside the plot only averaged 62 bushels, the yields ranging from 83 to 43 bushels. The leading places were again filled by Fitzroy, the late sorts failing badly with blight. The honor of winning the contest fell to Mr. A. H. Norris, whose Fitzroy entry averaged 99 bushels 22 lb. over the two plots. It is noteworthy that entries of this variety filled all the leading positions, a splendid performance, especially under adverse conditions.

TABLE of Yields.—Mount George Agricultural Bureau Contest.

Competitor.	Variety.	Somerset Plot. (Mr. C. Shields)		Woodside Plot. (Mr. A. Andrews).		Average Yield of the Two Plots.	
		bus.	lb.	bus.	lb.	bus.	lb.
A. H. Norris	Fitzroy	115	28	83	17	99	22
J. P. Mooney	Fitzroy	109	9	77	33	93	21
Alex. Andrews	Fitzroy	109	33	77	1	93	17
D. Cameron	Fitzroy	111	44	70	0	90	50
Shields and Andrews	Fitzroy	110	44	66	26	88	35
Alex. Andrews	Manning Pride	105	18	66	2	85	38
C. Shields	Leaming	105	44	63	47	84	45
F. Cross	Golden Beauty	106	20	59	33	82	54
C. Shields	Golden Beauty	106	4	56	12	81	8
J. Cameron	Dawson's Yellow	110	36	50	20	80	28
C. Shields	Pride of Hawkesbury	112	6	48	34	80	20
J. G. Stitt	Pride of Hawkesbury	109	33	43	30	76	31
Alex. Andrews	Leaming	88	46	63	47	76	18
J. G. Stitt	Large Red Hogan	99	24	42	17	71	48
Average Plot Yield		107	11½	62	1	....	

GOLDEN SUPERB CONTEST.

Since the inauguration of this competition seven years ago none has been more successful than the one under review. Three plots were selected, viz., Temagog (Mr. E. H. Ducat), Smithtown (Mr. D. Duncan), and Austral Eden (Mr Notley). The latter was destroyed by the February flood and withdrawn.

Temagog Plot.—Rich loamy soil, previous crop being maize. Ploughed July, and again early in September; seed bed fairly dry, sown 6th September, 1927. The germination was fair, and young growth good, although checked by six to eight weeks dry weather and a few frosts.

Smithtown Plot.—Land broken up in 1926 and sown to maize. Ploughed in May, and again early in September. Soil in fair condition. Sown 14th September, 1927, and germination was good. The ground became very wet with continual rains, and it was impossible to keep it clean. Although inundated to the cobs by the February floods, the average yield was very good.

Entries.

The entries numbered eighteen, and the samples were from good to very fair, with one or two very poor. However, the seed sent for sowing was a vast improvement on previous years.

Rather dry frosty conditions prevailed over the early growing stages. During November, however, splendid rains caught the crop at the tasselling stage, and from then onwards, especially at Temagog, where the rainfall was not so abnormal as at Smithtown, the crops made magnificent growth.

TABLE of Yields.—Golden Superb Contest.

Competitor.	Temagog Plot (Mr. E. H. Ducat).		Smithtown Plot (Mr. D. Duncan).		Average Yield of the two Plots.	
	bus.	lb.	bus.	lb.	bus.	lb.
E. H. Ducat	144	20	108	15	126	17
H. M. Seccomb	132	34	102	22	117	28
W. A. MacMahon...	123	30	109	7	116	18
E. E. Booth	124	12	106	33	115	22
W. E. Ward	127	49	98	11	113	2
C. Ward	126	0	98	11	112	5
J. W. Booth	130	52	92	18	111	35
A. Jeffery	115	32	105	5	110	18
V. Wright	125	3	94	47	109	53
R. Waters	120	48	95	38	108	15
J. G. Stitt	114	33	99	49	107	13
F. Waters	124	12	89	45	107	0
P. Waters	112	20	99	2	105	39
Colin Smith	112	26	98	13	105	19½
E. Dornan, No. 2...	115	0	95	39	105	19
M. McMahon	114	32	94	47	105	19
E. Dornan, No. 1...	110	47	95	38	103	14
T. J. Cooper	113	17	93	9	103	2
Average Plot Yield ...	120	51	98	40		

The Yields.

Record yields were obtained at Temagog, where the whole plot averaged 120 bushels 51 lb. per acre, and individual yields up to 144 bushels were recorded. Whilst the more favourable season here suited the variety to perfection, the closer distances of sowing and the higher yielding strains now available have also been a contributing factor. Even now many old farmers contend that drills 3 feet 6 inches apart, and four grains every 2 feet 6 inches, is not close enough, but the contests aim more at getting the comparative yields between strains, and 3 feet 6 inches is close enough, especially as this is the usual distance adopted generally for the variety.

The Smithtown plot, although overshadowed by Mr. Ducat's, was a good one, but unfavourable conditions for the class of soil decreased yields considerably. Here, too, the Golden Superb plot yielded heavier than the main crop varieties sown the same day.

Upper North Coast (Palmer's Channel.)

M. J. E. SQUIRE, H.D.A., Agricultural Instructor.

DURING the past season the Palmer's Channel Branch of the Primary Producers' Union conducted a seed maize yield contest in co-operation with the Department. Eighteen entries were received, including two non-competitive entries supplied by the Department.

The season was a very wet one, and floods inundated the crops for a short period during February. The rainfall during the growing period was as follows:—December (1927) 313 points, January (1928) 395 points, February 682, March 246, April 495, May 517, and June 370, making a total of 3,018 points.

Planting was carried out on 21st and 22nd December, 1927, on alluvial soil, on the farms of Messrs. A. Ascoli and S. McIntyre. Both plots were harvested on 6th July, 1928.

Details of the Plots.

On Mr. Ascoli's farm the land was previously cropped with sugar cane (ratoon crop). The trash was burnt after the cane was harvested, and the land was disc-harrowed, ploughed, and rolled in September, October, and November. Owing to heavy rains early in December it was again ploughed, harrowed, and rolled just prior to planting.

The land on Mr. S. McIntyre's farm was previously cropped with potatoes. After harvesting the potatoes the land was ploughed early in December, and disc-harrowed and harrowed just prior to planting. Both plots were given the necessary after-cultivation, and were kept free from weeds.

The yields were as follows:—

TABLE of Yields—Palmer's Channel Contest.

Competitor.	Variety.	A. Ascoli's Plot.		S. McIntyre's Plot.		Average Yield of two Plots.	
		bus.	lb.	bus.	lb.	bus.	lb.
J. J. Gray	Ulmarra Whitecap ...	42	24	62	20	52	22
A. Ascoli	Fitzroy	57	41	44	42	51	18
Dept. of Agric. (non-comp.) ...	Fitzroy	50	5	48	1	49	3
,, ,, ...	Ulmarra Whitecap ...	47	2	49	45	48	23
M. McKinnon	Red Hogan	44	44	44	28	44	36
,, ,, ...	Fitzroy	43	0	45	0	44	0
R. McPherson	Hickory King ...	50	5	35	39	42	50
S. McIntyre	Hickory King ...	43	0	34	53	38	54
G. Davidson	Fitzroy	47	38	29	9	38	23
J. Garvan	Red Hogan	40	37	25	29	33	5
J. Marsh	Leaming	42	24	....		....	
E. R. Watts	Leaming	40	4	....		....	
P. S. Carter	Leaming	39	27	....		....	
T. Lollback	Golden Superb ...	38	50	....		....	
A. Blanch	Goldmine	35	20	....		....	
A. Ascoli	Golden Superb ...	26	29	....		....	
J. D. McKay	Golden Beauty ...	23	32	....		....	
W. Marsh	Leaming	Weevil infested seed, poor germination.					

It will be noted that there were a number of entries of early varieties. These were, however, only planted on Mr. A. Ascoli's farm, it being really too late in the season for best results to be obtained from such varieties.

CROSSING OF CUCURBITACEOUS CROPS.

MUCH misconception exists amongst farmers as to the natural crossing, or "inoculation," as it is sometimes popularly termed, of cucurbitaceous crops, which include pumpkins, melons, squashes, marrows, cucumbers, &c.

To clear this misconception, it can be definitely stated that—

Watermelons will not cross with rock melons, pumpkins, or any other crop.

Rock melons will not cross with watermelons or any other crop.

Cucumbers will not cross with any other crop.

Pumpkins, squashes, and marrows may cross with one another, but much depends on the variety.

The classification of the varieties grown in New South Wales of these latter three crops according to their botanical species and their affinity for natural crossing is one of the tasks the Plant Breeding Branch of the Department is engaged upon, in addition to the improvement in uniformity and quality of the principal varieties which have become mixed through inter-crossing.—H. WENHOLZ, Director of Plant Breeding.

Farmers' Experiment Plots.

MAIZE TRIALS, 1927-28,

Inverell District.

J. A. O'REILLY, H.D.A., Agricultural Instructor.

DURING the past season four farmers co-operated with the Department in conducting maize variety trials.

The winter and spring months of 1927 were comparatively dry, but good rains were recorded from November onwards. The season, generally, was favourable to the production of maize, and some satisfactory results were obtained.

RAINFALL.

1927.	points.	1928.	points.
June	149	January	538
July	23	February	629
August	55	March	186
September	19		
October	197	Total	2,584
November	468		
December	320		

Details of Plots.

Auburn Vale.—The soil is a black clay loam, which had been sown with wheat in 1927 and fed off. The land was worked with the springtooth cultivator prior to sowing. Sowing took place 17th December, 1927, with a double-row corn dropper, in rows 4 feet 3 inches apart. No fertiliser was used. Germination was good, except in the case of Meadowbrook, and sturdy growth was made throughout. The plots were cultivated in January, February, and March, and were of clean appearance.

Gum Flat.—The soil is a black basaltic loam, which carried a crop of wheat in 1927. The wheat was cut for hay, and sowing was carried out by hand on 14th December, 1927. The land was disc-cultivated prior to sowing, and the seed planted in rows 4 feet 3 inches apart and two grains every 20 inches. No manure was used. The plots were cultivated once with a disc hiller.

Mount Russell.—The soil is a black basaltic loam, and was ploughed in February, 1927. The rigid-tine scarifier was used in September and November, and harrowed prior to sowing. The seed was sown 16th December, 1927, in rows 4 feet 3 inches apart, with a maize-dropper attached to a mouldboard plough, and then harrowed. The plots were cleaned with the springtooth and disc cultivators.

Dog Trap (Inverell).—The soil is a chocolate loam, sown to barley in the autumn of 1927, and fed off. The maize was ploughed in, in rows 4 feet 3 inches apart, on 22nd December, 1927. No manure was used. The plots were springtoothed in January, 1928.

RESULTS of Variety Trial.

Variety.	Vale, Inverell.		Flat, Inverell.		Trap, Inverell.		Mt. Russell.	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Funk's 90-day ...	80	51	38	14	69	25	45	0
Eureka	69	42	34	24	66	37	36	36
Funk's Yellow Dent ...	69	21	33	8	55	31	41	8
Craig Mitchell	62	28	30	34	63	50	....	
Large Goldmine ...	61	21	35	39	44	25	38	32
Golden Superb ...	60	46	38	14	66	37	40	28
Golden Glow	57	27	35	39	38	5	39	48
Wellingrove	54	7	33	8	55	31	44	20
Early Morn	48	0	38	14	52	44	37	52
Tewell's Star	45	11	25	28	41	37	32	44
Meadowbrook	31	14	10	47	25	0	....	
Kennedy	....		....		....		41	8

A feature of the trials was the success of Funk's 90-Day in all centres.

Cob rot was noticeable in Large Goldmine at Gum Flat, but apart from this the plots were reasonably free from disease.

If maximum results are to be obtained in this district farmers are reminded of the necessity for early preparation of the land and careful attention to seed selection.

Northern Districts.

MARK H. REYNOLDS, H.D.A., Senior Agricultural Instructor.

A NUMBER of farmers co-operated with the Department in carrying out fertiliser and variety trials in this district during the 1927-28 season.

RAINFALL at Various Centres.

Centre.	On Fallow.	On Crop.
	points.	points.
Allendale	170	1,459
Singleton	269	2,334
Maeranie	440	2,650
Tenterfield	130	3,322
Woolamin	770	1,957
Uralla	486	3,305
Ben Lomond	85	2,936
Red Range	297	4,365
Segenhoe	96	2,333
Tenterfield	224	3,237
Armidale	50	2,300
Sunnyside	1,288 (9 months)	1,718
Ravensworth	157	2,217

Following a dry spring, good general rain set in. Unfortunately, excessive falls in February and March damaged some crops and materially reduced yields. Crops were generally free from disease, a little cob rot only being noticed.

The rainfall appears plentiful at all centres, but unfortunately the large totals are due in most cases to excessive rainfall in November and February, amounting to 10 inches at some centres.

The Fertiliser Trial.

Ravensworth.—Soil deep, sandy loam, sedimentary. Previous crop barley, fertilised with 112 lb. per acre of equal parts of superphosphate and sulphate of ammonia; fed off green from time to time. Ploughed 31st August, harrowed 7th September, ploughed (7 inches deep) 8th September, and springtoothed two days before sowing. Sown 8th November, in rows 4 feet 6 inches apart, the fertiliser being applied after the grain. The land was harrowed to cover the seed. Fitzroy was the variety used, and one cultivation was given between rows, followed by a hilling. The crop grew to a height of 9 feet, and was harvested at end of April.

Sunnyside.—Soil deep, sandy granitic loam; not cropped in 1926, maize in 1925. Ploughed 6 inches deep in April; harrowed and cultivated 6 inches with springtooth; ploughed 29th October; cultivated with springtooth three times and harrowed once prior to planting. Drills were opened up 3 feet 6 inches apart and 3½ inches deep, and single grains dropped 18 inches apart and covered by two harrowings. Manure was applied with the seed on 10th October. Harvested 21st June, 1928. Funk's Yellow Dent was the variety.

On the property a small rotation experiment was carried out, the results of which are interesting:—

Maize after cowpeas yielded 40½ bushels per acre.
Maize after maize yielded 33 bushels per acre.
Maize after potatoes yielded 34½ bushels per acre.

None of the crops was fertilised. An increase in yield of 7½ bushels per acre after a legume indicates that more attention might be paid to this rotation.

Armidale.—Soil brown to gray medium basaltic loam. Previous crop maize for grain, unfertilised. Ploughed at end of August, 7 inches deep; cultivated October, 5 inches deep. Drills opened with plough 4 feet apart, seed and fertiliser planted on 4th October, 3 inches deep, single grains every 15 inches. Seed covered by two harrowings. In the early stages M30 and M16 stood out, but later little difference could be noticed. Harvested 12th May. Variety, Large Goldmine.

Tenterfield (J. T. Weir).—Soil deep, sandy gray granitic loam. Previous crop maize, unfertilised. Stalks burnt and land springtooth cultivated early August, ploughed 6 inches deep mid-August, harrowed and springtooth cultivated both ways on 11th October, and harrowed again. Maize sown in

rows 3 feet 9 inches apart on 3rd November. Subsequent cultivations were given on 25th November and 3rd December. Harvested 24th May. Variety, Iowa Silvermine.

Segenhoe.—Soil black alluvial loam. Previous crop potatoes and maize (two crops in one season), both unfertilised. Ploughed 9 inches deep in July, harrowed and rolled. Ploughed 12th September, harrowed and rolled. Funk's Yellow Dent was sown in rows 3 feet 2 inches apart with maize dropper, one grain every 12 inches, manure being applied at the same time. The furrows had been previously opened out with a plough. Scarified when crop was 1 foot high, irrigated and scarified again a few days later. Crop was also hilled. Harvested 4th May.

Maeranie (S. Burley).—Soil deep alluvial medium loam. Previous crop maize for grain, no fertiliser used. Stalks burnt and land ploughed in May, 7 inches deep, harrowed and rolled; harrowed and ploughed mid-October, 6 inches; harrowed and rolled again just prior to sowing (19th November). Drills opened up 3 feet 6 inches apart, seed and manure sown together—single grains dropped 15 to 18 inches apart, and covered with a Planet Junior. Three subsequent cultivaions were given with the Planet Junior. M30 and M16 treated plots stood out early, followed by M23 and superphosphate. Harvested 30th April. Leaming was the variety used.

Ben Lomond.—Both variety and fertiliser trials were conducted by this experimenter. Preparation of the land, &c., was the same for both trials. Previous crop was culinary peas, without fertiliser. Soil black friable medium, somewhat low-lying. Ploughed at end of July, 5 inches deep: harrowed 3rd October, after rain, and drills opened up 3 feet 4 inches apart: grain sown singly 15 to 18 inches apart on 5th October, covered by two harrowings. No fertiliser was applied in the case of the variety trial. The crop was cultivated three times up to 22nd November, the final cultivation being a hilling. Harvesting was carried out on 18th May, 1928.

Red Range.—Both variety and fertiliser trials were conducted by this experimenter, treatment of land, &c., being identical in each case. Soil red medium basaltic loam. Previous crop was wheat, unfertilised. Ploughed June, 5 inches deep, cultivated and harrowed twice. Last cultivation was given on 10th October. Grain was sown on 15th October in drills 3 feet 6 inches apart and 3½ inches deep, three grains being dropped every 3 feet. No fertiliser was applied to the variety trial. The seed was covered by two harrowings, scuffled on 8th November, and again on 24th November. Golden Glow and Wellingrove had matured by 1st May, and all other varieties except Hickory King by end of May. Hickory King matured second week in June.

Mitchell's Flat (C. Beh).—Soil deep medium alluvial loam. Previous crop oats, no fertiliser. Ploughed twice mid-June, 6 inches deep, and again at end of October. Rolled and harrowed just prior to sowing. Goldmine variety was sown with fertilisers planted in rows 3 feet 9 inches apart, and single seeds every 15 inches. An inter-row cultivation was given on 17th December, and all plots were hilled on 31st December. Harvested 24th April, 1928.

RESULTS OF MAIZE FERTILISER TRIAL.

Fertiliser.	J. Connell. Ravensworth.			H. Johnson, Sunnyside.			P. Short, Armidale.			J. T. Weir, Tenterfield.			E. Stafford. Segenhoe.		
Variety	Fitzroy.			Funk's Yellow Dent.			Large Goldmine.			Iowa Silvermine.			Funk's Yellow Dent.		
	Fertiliser.			Fertiliser.			Fertiliser.			Fertiliser.			Fertiliser.		
	lb.	bus.	lb.	lb.	bus.	lb.	lb.	bus.	lb.	lb.	bus.	lb.	lb.	bus.	lb.
Superphosphate ...	67	46	11	104	45	48	186	78	0	...	52	46	94	85	0
M16	93	38	28	144	56	21	261	84	27	290	66	44	130	89	40
M23	86	41	0	135	40	7	246	74	0	...	59	28	130	85	0
M30	113	41	0	175	51	32	316	85	0	340	66	44	157	92	26
Blood and bone... ...	87	41	0	127	40	7	231	81	29	...	63	8	...	...	
Unfertilised	...	34	20	...	42	2	...	66	39	...	60	40	...	86	20
Blood and Bone and Superphosphate* ...	...	...		116	47	43	...	...		...	...		143	78	0

Fertiliser.	S. Burley, Macranie.			J. W. Jay, Ben Lomond.			H. Brookfield, Red Range.			C. Beh, Mitchell's Flat Singleton.			H. J. Lambert Singleton.		
Variety	Leaming.			Ben Lomond Goldmine.			Jacob.			Goldmine.			Golden Surprise.		
	Fertiliser.			Fertiliser.			Fertiliser.			Fertiliser.			Fertiliser.		
	lb.	bus.	lb.	lb.	bus.	lb.	lb.	bus.	lb.	lb.	bus.	lb.	lb.	bus.	lb.
Superphosphate ...	106	60	28	...	61	49	216	28	0	120	47	42	...	40	0
M16	149	69	0	...	68	53	298	29	14	140	70	20	...	52	0
M23	138	71	42	...	67	10	277	27	0	127	59	42	...	50	16
M30	181	64	28	...	60	6	362	28	28	170	45	42	...	50	16
Blood and bone... ...	132	72	28	...	68	53	264	27	0	135	61	42	...	52	0
Unfertilised	...	55	42	...	70	40	...	25	28	...	56	28	...	50	16
Blood and Bone and Superphosphate* ...	...	...		...	...		...	...		...	...		...	...	

* Four parts of blood and bone to one part of superphosphate.

M16 mixture consists of 5 parts of superphosphate and 2 parts of sulphate of ammonia; M23, 10 parts of superphosphate and 3 parts sulphate of potash; M30, 10 parts superphosphate, 4 parts sulphate of ammonia and 3 parts sulphate of potash.

Singleton (H. Lambert).—Soil deep alluvial sandy loam. Previous crop maize, no fertiliser. Ploughed mid-September, 9 inches deep; ploughed again in November, 6 inches; harrowed and rolled mid-October, and harrowed after last ploughing. Golden Surprise variety was sown with the fertilisers on 17th November, 1927, in rows 3 feet 9 inches apart, and three grains every 3 feet. Disc cultivated twice between the rows.

The Variety Trial

Scott's Flat.—Soil deep black medium loam. Previous crop pumpkins. Land ploughed in June, 7 inches deep. Twice ploughed again before November, and harrowed and rolled after each ploughing. Drills were opened up 3 feet 6 inches apart, 3½ inches deep, and seed sown on 5th November.

Broke.—Soil deep sandy alluvial. Previous crop maize for grain, without fertiliser. Land ploughed in June, 9 inches deep; harrowed and ploughed 9 inches deep in October; harrowed again just prior to sowing. Drills were opened up 3 feet 6 inches apart, and two or three grains sown every 2 feet on 8th December. A satisfactory stand was obtained with all varieties, a height of 2 feet being reached on 3rd January, 1928, by which time two scufflings had been given. Harvesting was carried out in May.

Allendale.—Soil medium deep black loam. Previous crop was oats for green feed, manured with 60 lb. superphosphate. For fifty years prior to that the land was under grape vines. Ploughed in July, 10 inches deep, and also three times subsequent to planting. The maize was planted on 24th November in rows 4 feet apart, two or three grains every 3 feet.

Superphosphate was applied to all plots at the rate of 112 lb. per acre. "Middles" were cultivated twice with a springtooth cultivator and once with a skim plough, and hilled. Harvesting was carried out on 10th May.

Singleton (A. McLean).—Soil deep alluvial medium black loam. Previous crop maize, unfertilised. Ploughed Easter, 1927, 7 to 8 inches deep, and not worked throughout the winter after being harrowed. Ploughed end September, 6 to 7 inches, harrowed and rolled. Harrowed before opening drills for seed. Drills 3 feet 6 inches apart, two grains every 2 feet, sown on 14th November. Harrowed immediately after sowing. Two cultivations were given between the rows. Andrews' Maize matured first, followed by Golden Superb, and Fitzroy latest. Andrews' Maize grew to 6 feet, Fitzroy to 9 feet 6 inches. Harvesting was carried out early in May.

Maeranie.—Soil deep black to gray alluvial loam. Previous crop maize, unfertilised. Stalks were burnt. Land was ploughed in June, 9 to 10 inches deep, and harrowed twice after rain; ploughed again shortly before sowing to a depth of 9 inches. Drills opened with plough 3 feet 9 inches apart, and single grains planted 15 inches apart in drills on 15th November. One cultivation was given between the rows on 26th February. Early growth was somewhat checked by excess moisture. Goldmine matured earliest, and grew to a height of 6 feet. Harvesting was carried out on 30th April.

Tenterfield.—Soil dark gray granitic. Previous crop potatoes, fertilised with half and half superphosphate and blood and bone, 2 to 3 cwt. per acre. Potatoes dug in July, land scuffled directly after and harrowed, and portion

ploughed 6 inches deep. Drills opened up 3 feet 6 inches apart and 5 inches deep. Grain was sown on 12th October, single grains 15 inches apart, and covered by a ploughing. A second sowing was made on 15th December. Harvesting was carried out on 15th May.

Woolamin.—Soil deep medium alluvial. Previous crop wheat for grain, no fertiliser. Ploughed July, 5 inches deep, harrowed twice in October, no further cultivation being given. Maize was sown in rows 3 feet apart, three grains every 36 inches, and ploughed on 6th December. Crop was only inter-cultivated once, on 3rd January. Harvested early May.

Uralla.—Soil upland red basaltic medium loam. Previous crop maize, no fertiliser. Ploughed March, 4 to 5 inches deep; cultivated 4 to 5 inches deep in June; ploughed last week in September, 4 to 5 inches deep. Sown on 3rd October, in drills 4 feet apart, single grains being dropped every 15 to 18 inches. Covered by Planet Junior, and later harrowed. Wellingrove lodged badly, and Golden Glow was also poor. Harvested 15th May.

Ben Lomond and Red Range.—Preparation of land, &c., at both these places were the same as for the fertiliser trials.

RESULTS OF MAIZE VARIETY TRIAL.

Variety.	H. Maloney, Scott's Flat.	V. Woods, Broke.	F. J. Sealey, Allendale.	A. McLean, Singleton.	A. E. Brooker, Macranie.	C. Mills, Woolamin.	R. H. Wilkinson, Uralla.	J. W. Jay, Ben Lomond.	H. Brookfield, Red Range.	W. Reddacliff, Tenterfield.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Craig Mitchell ...	...	...	38 0	45 0	...	...	...	...	...	...
Golden Superb ...	83 34	...	42 28	48 32	...	...	43 42	...	...	...
Yellow Hogan ...	...	...	47 0	...	...	...	...	...	...	..
Fitzroy	...	112 0	47 0	45 0	31 0	...	...	...	...	...
Funk's Yellow Dent	102 48	...	33 0	...	31 22	60 0	...	...	...	...
Leaming	111 8	79 0	44 0	...	56 28	...	...	...	...	...
Andrews' Maize ...	...	...	...	43 37	...	...	...	...	...	...
Goldmine	...	...	...	...	53 0	...	42 0	49 28	19 25	47 0
Early Morn ...	...	...	...	...	...	55 0	...	...	...	...
Meadowbrook ...	...	...	...	...	...	43 0	...	...	...	...
Boone County White	...	...	...	...	...	...	...	...	...	53 42
Gold Coin	...	...	...	...	...	...	44 0	58 19	...	46 0
Eureka	...	...	...	...	...	...	...	...	...	53 0
Wilkinson's Select...	...	...	...	...	...	...	47 28	...	22 6	44 28
Hickory King ...	...	...	...	...	...	...	...	...	31 46	53 42
Wellingrove ...	...	...	...	...	...	...	33 28	53 2	18 32	47 0
Golden Glow ...	...	...	...	...	...	50 0	27 0	60 6	24 42	41 28
Tewell's Star ...	...	...	...	...	...	56 6	...	...	...	...
Duncan's Y. Dent ...	...	...	...	...	...	50 0	...	...	...	...
Jacob	...	...	...	...	...	47 0	...	58 19	23 49	...
Ben Lomond Goldmine	...	...	...	...	...	...	...	61 49	...	...
Shannon Vale Silvermine	...	...	...	...	...	...	...	...	24 42	...
Leaming (farm seed)	77 8	84 0	...	...	...	...	...	...	...	...
Morris Maize ...	...	94 0	...	...	...	...	...	...	...	...

ADVANTAGE OF SPROUTING SEED POTATOES.

THE main advantage of sprouting seed potatoes is that it ensures a substantial increase in the yield of the crop. The average increase due to sprouting, as demonstrated in over 1,400 practical tests conducted throughout Ireland, is almost 2 tons per statute acre, and this increase is mainly in saleable potatoes.—Leaflet No. 58, Department of Agriculture, Ireland.

Variation in Cereals.

J. T. PRIDHAM, H.D.A., Plant Breeder.

EVERY wheat farmer of experience has observed how a variety of wheat or oats in his field shows odd plants which vary from the recognised type of the variety. By this is not meant rogue or stranger plants of a different variety which occur through accidental admixture, but natural variations, which arise apparently spontaneously, and which bear some resemblance to the variety. These variations may arise as the result of either (1) natural crossing or (2) mutation or "sporting."

The plant breeder can readily distinguish whether a particular variant plant is due to natural crossing or to mutation by examination of the progeny. If the variant is a true mutation it will be very similar to the original variety type in most respects, differing only in one or a few characters such as colour of "chaff," awnedness, &c., and will breed entirely true to the variant type unless it again quickly mutates (which occurs rather rarely). If, however, the variant is due to natural crossing its progeny will not show fixity in all characters and will continue to vary for some years. It is true that if the variant is produced as the result of natural crossing, and its observed variant character or characters are pure dominant or recessive, it will then breed true for those characters, but the fact of its showing variation in other characters will definitely point to its crossbred origin.

It is of some importance to the plant-breeder to learn whether a variant is due to natural crossing or to mutation, for in the latter case, the mutant plants are generally of a retrogressive nature as far as yield factors are concerned, seldom proving superior to the parent stock, while variations due to natural crossing often result in a superior variety eventually being fixed from them. In any case, any variant plant which appears to have good characters is always worth selection for testing and observation of the progeny.

Natural Crossing in Wheat.

At flowering time the glumes of the wheat flower usually open, and a portion, or, at times, most of the pollen escapes into the air, to fall upon the adjacent flowers or to be carried to them by the wind. Flowers which for any reason are devoid of pollen are, of course, liable to cross fertilisation. Hilgendorf, of New Zealand, has found that excessive cold kills the anthers, leaving the stigmas unaffected, such a condition favouring natural crossing. Engledow, in England, considers that warmth rather than low temperatures contributes to the phenomenon. Howard, in India, has observed that dry, hot weather, associated with irrigation, promotes the longer opening of the glumes to the danger of infection with foreign pollen.

Jenkin, of Wales, as a result of his observations at Aberystwyth, thinks that though climate plays a part, the variety is of more importance, some being more susceptible than others. He found natural crossing in two

Welsh varieties, but it was comparatively rare, about 1.3 per cent. occurring. At Arlington Farm in United States, America, Leighty and Taylor studied the subject for the ten-year period 1917 to 1926 inclusive. Natural crossing occurred frequently in 1917, 1920 and 1924, the percentage varying with different varieties, the differences being often due to environmental conditions. They found that weather conditions made little difference, cases being noted during both dry and wet flowering periods. The secondary or later tillers in a plant were more susceptible than the main stools.

Nilsson-Ehle has shown by experiments in 1915 in Sweden that some varieties are more liable than others. Hayes, of Minnesota, in 1916 found ten instances, and in 1917, out of thirty-six plots, twenty-one had from one to eight plants that were clearly F1 crosses.

Garber and Quesenberry at West Virginia Experiment Station grew 1,461 pure line selections of wheat in 1922, and of these fifty-nine or 4 per cent. appeared to be of hybrid origin. On sowing seed of these fifty-nine plants again, eleven of them showed that they were not hybrids. The variety Mammoth Red produced most F1 plants, while the variety China yielded none. Relatively more F1 plants were found among the earlier-flowering varieties, which headed mostly during clear sunny weather, than among the later varieties which headed in cloudy weather.

Experience at Cowra Experiment Farm.

At Cowra, in 1927, a collection of ears selected in 1926 from farmers' crops was grown with the result that seven out of 233 types showed variation which did not head true, suggesting natural crossing. The system in operation is that the increase plots descended from a selected plant two years before are inspected for purity before harvesting, and for any departure from type that is likely to have occurred by natural crossing the year before in a 30-link row. These rows are 16 inches apart, with a check variety in alternate rows. That the variants show a red chaff so commonly is good evidence of cross fertilisation, as the check has been Hard Federation or Bena for the past few seasons.

The following are brief meteorological notes for the flowering periods during the growing seasons, with an indication of the amount of natural crossing that occurred the following year:—

1922.—Dry weather towards the end of October caused wilting, and hot days in November early ripening.

The following season a number of variants were noted:—15 in Wandilla, 13 in Onas, 7 in Bandon, 14 in Sultan, 5 in Yuna, 3 in Federation, 3 in Waratah and 3 in Booral.

1923.—September was cool, with good rain early in the month. Dry till the last day of October, the ground cracking; rain then fell.

The following season 7 variants were seen in Wandilla, 1 in Oadia, 1 in Cargo, 3 in Union, 12 in Thew, 5 in Binya, 2 in Gresley, 2 in Boonoo, 7 in Firbank, 5 in Gullen, 3 in Bunyip, 5 in Sunset, 3 in Goonoo, 5 in Early Bird and a number in Florence.

1924.—This was a rusty season, a good deal of rain falling in the late spring. The season following produced only 5 variants in Firbank and 3 in Florence.

1925.—Rather a dry spring until 130 points fell on 30th September; good conditions for grain production followed. During the ensuing season only a few variants emerged in Duchess and 7 in Boolaroo.

1926.—August was cold, frosts lasting till the second week in September, checking growth. The season favoured early varieties.

The season following was a bad one for natural crosses, cases being found in Federation and Wandilla, 2 in Ford, 2 in Stamina, 20 in Bald Early, 4 in Gresley, 2 in Currawa, 12 in Thew, 2 in Plowman's 4P, 1 in Burrill, 1 in Boonoo, 2 in Plowman's 137, 1 in Nabawa, 3 in Cookapoi, 2 in Clarendon, 1 in Morven, 1 in Early Bird, 7 in Noongar, 11 in Bunyip, 1 in Florence and several in Barwang.

Wheats which Originated from Natural Crossing.

The histories of Marshall's No. 3, which originated in South Australia, and of Hard Federation and Bena which were produced in New South Wales, indicate that they arose from natural crossing. In these cases the original variant plants showed considerable unfixity in the progeny which would not have been the case if they had arisen by mutation.

Of *Marshall's No.* 3 Mr. R. Marshall, of Adelaide, said in 1915: "I selected a plant from a crop of Ward's Prolific in the latter part of the eighties. It bore four heads; one I sent to Mr. Farrer, one to the Victorian Department of Agriculture, and the other two I planted. The result was about one-third white-strawed and the balance purple-strawed plants. By this, I concluded it was a natural cross, as the original had very purple straw. Further sowings gave a similar result, but less pronounced. From the results of the second sowing I kept the white and purple-strawed plants separate, naming the white Silver King."

Hard Federation.—In 1907 it was noticed at Cowra Experiment Farm that one strain of Federation varied a good deal in the colour of the ears, some heads being almost white. This character continued to vary in subsequent generations, and variations in other characters such as type (shape) of ear, strength of straw, quality of grain, &c., were also observed. In 1913 a pure, dominant, brown-eared straw was selected, and this and other varying characters were fixed. The variety was named Hard Federation in 1914.

Bena.—In 1916 a plant very free from rust was harvested from the rows of Hard Federation. In 1917 it did not appear to vary, but in 1918 was noted as unfixed. In 1919, 123 plants were selected, and the families were found to vary in colour of ears, beardedness, and grain quality. In 1922, a strain was fixed and called Bena. It is considered that it was a natural cross between Hard Federation and Marshall's No. 3.

In addition to these, a number of wheats are considered to have arisen from natural crossing, but the evidence from farmers concerning the early behaviour of their progeny is not sufficiently clear and detailed to determine accurately whether they arose as the result of natural crossing or by mutation.

Mutations in Wheat.

Although not as common as variations due to natural crossing, mutations occur far more commonly than is generally supposed. Many cases have been known in which the variant or "sport" was exactly like the parent stock or variety in which it was found, except for one or two observable morphological characters.

Many variations are appearing to-day in our standard varieties, and these need to be examined by the plant breeder to determine to which class they belong. Several years ago at Longerenong College in Victoria, a few plants with a distinctly clubbed ear were seen in a field crop of Federation, and two lines were isolated which bred true with a tip-awned clubbed ear.

Many types have appeared in the variety Hard Federation which looked identical with the parent variety except that the ear was white instead of brown. Variants in Firbank have appeared quite like the mother except for tip awns. Duchess has recently given rise to a white-eared plant which bred true for this character. And recently some white-grained selections have been made from red-grained varieties which vary in no other characters and which are apparently mutations.

More rarely mutations are found embodying changes in more than one character, although it is possible of course that a single factor may control the expression of more than one character.

While natural crossing is to be expected more as the result of seasonal or environmental conditions, although some varieties may be more prone to it than others, it is certain that mutations may be expected more often in the newer varieties which have resulted from artificial crossing than in the older sorts such as the purple straws

Mutations are the result of the loss or permanent impairment of a factor affecting a hereditary character, which thus alters its expression, such as by changing a brown ear to a white ear, but with this morphological change, it is reasonable to suppose that the same factor may be responsible for affecting physiological yield characters which are not observable except by the behaviour of the progeny. It is easy to understand why most mutations, which involve the loss rather than the addition of a hereditary factor, are retrogressive rather than progressive or superior in such characters to the parent stock.

Natural Crossing in Oats.

Natural crossing also occurs in oats in New South Wales, and is generally ascribed to the same environmental influences as in the case of wheat. It is known, for instance, that more natural crossing takes place in oats at Cowra, where the climate is comparatively warm, than at Bathurst and Glen Innes, where it is relatively cool during the flowering period.

The well-known variety Sunrise is considered to be the result of a natural cross with Algerian, and it has since given rise to a number of variations which are undoubtedly mutations.

An individual was also found in Chinese Skinless oats which for some characters segregated in Mendelian ratios, indicating its crossbred origin.

Mutations in Oats.

Belar is an instance of an oat mutation. It was selected from a plot of Sunrise and afterwards bred true. Another case was Kelvin which was a head selection made from a crop of Fulghum in 1922. It stood out in 1924 as the most desirable of a large number of head selections on account of its strong straw and erect, stiff leaves. These characters were faithfully reproduced. Fulghum has shown variations in foliage, type of panicle, stooling, earliness and grain characters.

Sunrise has proved a gold mine for selection, yielding a profusion of types from black, hairy, false wild oats with a forbidding awn, to kernels as plump, white and smooth as the finest cultivated variety. Ruakura also has provided much material for selection, and highly rust-resistant types may yet be found in this variety which originally appeared resistant.

False wild oats have been found in Algerian and Lachlan besides the derivatives from Sunrise. These fatuoids have no parallel in the wheat crop. Further light has been thrown on the subject of false wild oats by C. L. Huskins, who has found that certain awnless oats lack the chromosome factors for the production of fatuoids. Ordinary varieties of *Avena fatua* and other closely allied species, however, have chromosome-bearing factors for the fatuoid complex. If commercial varieties are crossed with these awnless varieties, progeny should result including good yielding plants which are free from these factors. Professor Shegalov, of Russia, is experimenting with the awnless types which do not yield well of themselves.

That the fatuoids uniformly germinate more readily than wild oats, seems to point to their origin by mutation. *Avena fatua* differs from the fatuoid forms in showing delayed germination, the seed coats being thick. The "horseshoe" tip to the grain does not invariably indicate *A. fatua*, for types with similar grain, having a black seed coat, have been found in Mulga oats enveloped in an outer husk nearly white in tint and smooth. Though fatuoid types have sometimes appeared productive, further propagation has lead to disappointment, and one looks rather to artificial crossing for improvement in varieties.

Barley.

The writer has had no experience of variation in barleys beyond the fluctuating variation of degree of awn. A plant showing awns deciduous or partly so usually reverts to the fully-awned character when pedigreed. At the Bathurst Experiment Farm a natural cross was found in barley some years ago, but nothing worth while resulted from it.

Conclusion.

Though climatic conditions are not a safe guide to the occurrence of natural crossing, it appears that a rainy and cool spring militates against it; we do not find the trouble to any extent at Bathurst, Glen Innes or on the coast. No variety has shown itself particularly susceptible so far, but early-maturing sorts as a class are more liable than late. In the light of recent evidence it is now considered to be most desirable at Cowra to save the main or primary stools only from a selected plant, rejecting the secondary ones, and in triplicate plots to discard the seed of the two outside rows, retaining only that from the centre.

Variations which breed true may be regarded as mutations while those giving rise to heterogeneous types are to be considered the result of natural crossing.

Outstanding individuals are worth testing out for yield, but more promising material is likely to emerge from artificial crossings with parents showing valuable qualities, even though widely dissimilar; back crossing with an approved type generally brings the desired result.

It will be seen how difficult it is for farmers to keep their cereal crops true to type, and how necessary it is for them to obtain pure seed in small lots at frequent intervals.

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"Wheat in India," 1909, by A. Howard and G. L. C. Howard.

"Natural Crossing in Wales," by T. J. Jenkin. *Welsh Journal of Agriculture*, vol. 1, 1925, p. 104.

"Studies in Natural Hybridisation of Wheat," by C. E. Leighty and J. W. Taylor. *Journal of Agricultural Research*, vol. 35, 1927, p. 865.

"Natural Cross Pollination in Wheat," by H. K. Hayes. *Journal of American Society of Agronomy*, vol. 10, p. 180.

"Natural Crossing in Winter Wheat," by R. J. Garber and K. S. Quesenberry, *Journal of American Society of Agronomy*, vol. 15, p. 508.

"Des Mutations chez les Cereales." *Journal d'Agriculture Pratique*," 1928. No. 16, p. 346.

"False Wild Oats," by C. L. Huskins. *Scientific Agriculture*, April, 1927, p. 285.

Milk and Thunderstorms.

A Dutch milk supplying company recently investigated the subject of the influence of thunderstorms on the development of acid in milk in a hope of being able to throw some light on superstitious tales of milk suddenly turning sour during electrical storms.

It was investigated whether milk would turn sour more quickly if exposed to an electrified atmosphere than if kept out of it, and it was shown that neither the effect of alternate current, nor that of constant current of equal tension as observed during thunderstorms, would have any influence on the quantity of acid in the milk, although exposed for fifteen hours. The opinion is, therefore, expressed, that electrical power, whether of atmospheric origin or otherwise, has no noticeable influence whatever on the rate at which the spontaneous acidification of milk takes place.

It is thought that the real cause of milk turning sour during a thunderstorm is found in the higher atmospheric temperature generally prevailing previous to such storms.

Cold Storage of Onions.

EXPERIMENTS CARRIED OUT AT THE MUNICIPAL COLD-STORAGE WORKS, SYDNEY.

WILLIS J. WILLIAMS, F.C.S., Manager.

FOLLOWING on the successful experiments carried out at these works in the storage of potatoes,* somewhat similar tests were conducted in connection with the treatment of onions by refrigeration, and the results have demonstrated that onions can be kept in good condition from March till the end of December by this means, thus greatly facilitating the distribution of this product.

Hitherto the only means of keeping onions has been by dry or common storage, but the loss by shrinkage and general deterioration could not be avoided by this method, and the inability to control the temperature and humidity is responsible for the quick spreading of disease.

As in the case of potatoes, it was felt that some method was necessary to enable the producer to supply a better article over a longer period, which obviously must be a great advantage to the consuming public, and it was with this object in view that refrigeration was tried as a means by which this desired state of regulating the onion supplies could be achieved. Consequently on 18th January, 1928, a quantity of onions were placed in store at various temperatures ranging from below freezing point to 38 deg. Fah. The onions were also kept in two classes: (1) Freshly dug and placed in store, and (2) well-matured onions which had been dried and cured in the fields for some days. The two varieties treated were the commonly used Brown Spanish and the Silver Skin.

The onions were inspected from time to time, and after three months specimens were taken out and examined. The onions were then found to be in an excellent condition and had a good appearance, particularly those that had been stored at a temperature below freezing point which, in the case of onions, is 29 deg. Fah. The Silver Skins, on thawing out, were found not to have stood too well out of store, although, as proved later, this could have been rectified to a certain extent by gradual thawing. The Brown Spanish stood the thawing well. After another period of about three months the balance of the onions were removed from store. This made a total period of storage of about six months.

The defrosting of those stored below freezing point extended over a period of two or three days, so as to make the thawing out as gradual as possible. This was found to be a necessary precaution as the onion is susceptible to sudden changes of temperature, and when exposed to sudden warmth it became very moist and sweaty as it could not readily absorb the water and oil. This was specially noticeable with the Silver Skin, which is

* For report on these experiments, see *Agricultural Gazette*, February, 1928, page 140.

naturally a moist variety. In the case of those defrosted gradually, the full qualities were retained, and they compared most favourably with fresh onions. In fact, the skin seemed firmer and more glossy than the fresh product. On cutting it was ascertained that the onions had a full natural flavour and had retained a perfectly healthy colour. Those stored above freezing point were also in excellent condition and, with the exception of a slight sprouting, were as good as when placed in store. The loss of weight was found to be just under 4 per cent., and this is very favourable compared with the loss in general storage, which is about 12 per cent. It was found that the best temperature at which to store onions is about 29 deg. Fah. If the preservation of the germ life of the onion for growing purposes is desired, then the lower temperature would be best.

It must be understood that care has to be exercised in the handling of this product before storing, as any bruise would be conducive to mould formation and decay in store. Onions must be thoroughly cured and dried in the fields for most beneficial results. The best method of storing would be in crates or on trays, but there is no reason why bags could not be used if the mesh were not too small, and provided they were stacked so as to leave plenty of air space, as the free circulation of air is essential.

Experiments have been conducted in America in the cold storing of onions, and it is interesting to note that in the main points the results coincided with the results of the experiments carried out at the Municipal Cold Storage Works, Sydney, the first tests of their kind carried out in Australia.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1929.

Dapto	Jan.	11, 12
Kangaroo Valley	,,	18, 19
Kiama	,,	25, 26
Moruya (H. P. Jeffery)	,,	25, 26
Lidcombe (J. Stinson)	,,	26, 27
Berry	Feb.	1, 2
Wollongong	,,	7, 8, 9
St. Ives (F. Clarke)	,,	8, 9
Tahmoor	,,	8, 9
Leeton (W. Rosewarn)	,,	12, 13
Nowra	,,	14, 15, 16
Castle Hill (W. H. Taylor)	,,	15, 16
Newcastle (E. J. Dann)	,,	19 to 23
Milton	,,	20, 21
Blacktown (A. J. Greenaway)	,,	22, 23
Robertson	,,	22, 23
Dorrigo (J. H. Skeoch)	,,	26, 27
Macksville (W. G. Hughes)	,,	26, 27
Maitland (M. A. Brown)	,,	27, 28, Mar. 1, 2
Oberon (C. S. Chudleigh)	,,	28, Mar. 1
Moss Vale (W. Holt)	,,	28, Mar. 1, 2
Taralga	,,	28, Mar. 1
Penrith (C. H. Fulton)	Mar.	1, 2
Tumut (H. Mount)	,,	5, 6
Crookwell	,,	5, 6, 7
Braidwood (R. L. Irwin)	,,	6, 7
Cessnock (Bill Brown)	Mar.	6, 7, 8, 9
Bowral Horse Show	,,	8, 9
Campbelltown (W. N. Rudd)	,,	8, 9
Rydal (H. Murray)	,,	8, 9
Luddenham (J. McKnight)	,,	8, 9
Gundagai (P. J. Sullivan)	,,	12, 13
Molong (W. P. Stanger)	,,	12, 13
Camden	,,	14, 15, 16
Mudgee (O. Wilkins)	,,	14, 15, 16
Goulburn (T. Higgins)	,,	14, 15, 16
Granville (B. Hyslop)	,,	15, 16
Kempsey (E. Mitchell)	,,	19, 20, 21
Wallamba (E. A. Carey)	,,	21, 22
Liverpool (B. C. Fitzpatrick)	,,	22, 23
Warringah (F. L. Parker)	,,	22, 23
Wingello (J. E. Creelman)	,,	23
Batlow (C. S. Gregory)	,,	26, 27
R.A.S., Sydney (G.C. Somerville)	,,	27 to Ap. 6
Orange (G. Williams)	April	16, 17, 18
Wingham (D. Stewart)	,,	17, 18
Grafton (L. C. Lawson)	,,	17 to 20
Hawkesbury (R. B. Tate)	,,	18, 19, 20
Stroud (C. E. Price)	,,	26, 27
Trangie (A. K. Butter)	May	15, 16
Wagga (F. H. Croaker)	Aug.	20, 21, 22
Ganmain (C. C. Henderson)	Sept.	10, 11
Narandera (J. D. Newth)	Oct.	8, 9

Farmers' Experiment Plots.

POTATO TRIALS, 1927-28.

Northern District.

MARK H. REYNOLDS, H.D.A., Senior Agricultural Instructor.

THE following farmers co-operated with the Department in conducting potato trials during the past season:—

J. W. Jay, Ben Lomond.
W. H. Bluford, Aberdeen.
J. Hill, Guyra.
W. Reddicliff, Tenterfield.
H. Brookfield, Red Range.
A. Brummer, Mitchell's Flat.
F. S. Garland, Singleton.

Although the total rainfall during the season was ample, the conditions were not ideal for potato growing. A dry spring caused a poor germination at most centres, and the abnormally heavy rains of February caused a large number of crops to rot, while continued wet weather delayed harvesting. Generally the season was more favourable in the southern portion of the district than in New England.

The rainfall at the various centres during the fallow and growing periods was as follows:—

Place.	Fallow. Points.	Growth. Points.
Ben Lomond	85	2,936
Aberdeen	...	1,365
Guyra	310	2,791 (1,077 in February.)
Tenterfield	88	3,081 (1,079 in February.)
Red Range	115	3,638 (1,656 in February.)
Mitchell's Flat	89	1,304
Singleton	1,025	2,232

The Plots.

Ben Lomond.—The land had not been cropped during the previous four years, but had been overrun with horehound. Soil, brown red, medium basaltic loam; ploughed 1st week August, 1927, 4 inches deep; harrowed 3rd October; drills opened out 6th October, 4 inches deep and 30 inches apart. No fertiliser was used in variety trial, and in the fertiliser trial the manures were spread along the drills by hand. Fertiliser trial sown 6th October, Symington being the variety used. Variety trial sown 7th October, whole sets being used 18 to 21 inches apart in the rows.

Germination was uneven, due to dry conditions. Inter-row cultivated on 6th December, cultivated again and hilled on 20th December, hoed twice to remove weeds in January. Owing to continued wet weather it was not possible to harvest this crop until August, and as a consequence a lot of tubers were lost by wet rot.

Aberdeen.—Although the trial here was irrigated, the germination was very poor, and the trials were abandoned.

Guyra.—Lack of rain in the spring caused poor germination and early growth in these plots. Good growth was made later, but unfortunately 10 inches of rain fell in February and wet rot destroyed the crop.

YIELDS in Potato Variety Trials.

Variety.	Mitchell's Flat.		Singleton.		Tenterfield.		Red Range.		Ben Lomond.	
	Yield.	Percentage of seed.	Yield.	Percentage of seed.	Yield.	Percentage of seed.	Yield.	Percentage of seed.	Yield.	Percentage of seed.
	t. c. q.		t. c. q.		t. c. q.		t. c. q.		t. c. q.	
Symington	...	...	...	...	4 16 0	31	2 7 1	17	5 2 0	24
Surprise	...	...	...	...	...	...	...	...	3 15 1	37
Northern Star ...	...	...	...	...	...	...	3 13 0	21	...	...
Parson's Satisfaction	...	...	...	...	...	...	2 11 0	35	...	...
Great Scott ...	...	...	...	...	5 12 0	53	4 5 0	30	9 12 2	28
Porter's Satisfaction	...	...	...	...	...	...	3 9 1	34	...	...
Up-to-Date ...	...	...	...	...	...	...	2 5 0	50	...	...
Early Manhattan ...	7 17 0	...	15 0 0	...	6 7 0	41	2 7 0	35	...	...
Epicure	...	...	...	...	5 6 0	47	...	...	...	...
Factor	11 4 0	...	14 0 0	...	6 5 0	46	4 0 0	49	11 5 2	49
Kerr's Pink ...	...	...	...	...	5 8 0	48	...	...	...	...
Batlow Redsnooth ...	5 12 0	...	12 10 0	...	...	...	...	...	...	...
Carmen	...	...	14 10 0	...	...	...	...	...	...	...
Teasdale	...	...	...	...	...	...	...	...	6 15 0	37
Coronation	...	...	...	...	...	...	...	...	7 4 2	39

Tenterfield.—Soil, dark grey granitic sandy loam. Previous crop potatoes and mangolds. Land ploughed in September 8 inches deep. Sown 12th October in drills 3 feet apart, 4 inches deep, with whole sets, except in the case of Symington; covered by a ploughing.

Cultivations were given on 19th and 24th November, and hilling was carried out on 6th December. All varieties except Symington were mature about 21st February, Symington being ripe about 10th March. Harvesting was carried out on 30th March. Factor was the variety used in the fertiliser trial.

Red Range.—Previous crop, maize for grain, unfertilised. Soil, red basaltic medium loam. Land ploughed 21st August, 4 inches deep, and harrowed a week later. Whole sets planted every 18 inches in drills 3 feet apart on 15th October, and covered by two harrowings. Satisfaction was used in the fertiliser trial. No manure was applied to the variety trial. Two harrowings were given in November and a scuffling on 3rd December.

Owing to wet conditions in February a large percentage of the potatoes rotted, and the balance was mostly dwarfed. Harvesting was carried out at the end of March.

Mitchell's Flat.—Previous crop was Sudan grass, unfertilised. Soil, deep sandy upland. Land ploughed early in winter, left in the rough for two months, then cultivated on occasions until August. Sown in drills 3 feet apart on 4th August. Harvesting was carried out in February, Factor producing the best quality tubers.

YIELDS in Potato Fertiliser Trials.

Fertiliser.	Red Range.		Tenterfield.		Ben Lomond.	
	Fertiliser per Acre.	Yield.	Fertiliser per Acre.	Yield.	Fertiliser per Acre.	Yield.
	lb.	t. c. q.	lb.	t. c. q.	lb.	t. c. q.
Superphosphate	196	2 18 0	273	6 9 0	308	8 16 0
P13*	259	3 9 0	361	6 14 0	407	5 10 0
P12†	231	2 13 2	321	6 16 0	362	4 14 1
P11‡	231	3 5 0	321	6 14 0	362	8 0 1
Blood and bone and superphosphate in equal parts ...	196	4 0 1	273	6 7 0	308	8 3 0
Unfertilised	...	3 2 2	...	4 4 0	...	8 0 0

* P. 13 consists of six parts superphosphate, one part sulphate of ammonia, and one part sulphate of potash.
† P. 12 consists of six parts superphosphate and one part sulphate of potash.
‡ P. 11 consists of six parts superphosphate and one part sulphate of ammonia.

Singleton.—Soil, medium alluvial loam; had grown a crop of potatoes the previous year. Ploughed in February 10 inches deep, again in June 10 inches deep. Springtoothed in August, and ploughed again 9 inches deep before planting, which was carried out on 1st September, tubers being set 15 inches apart in rows 3 feet apart. An inter-row cultivation was given in November, and plants were hilled by hoe. Harvesting was carried out during February.

THE WORLD'S LEMON SUPPLY.

IT is interesting to note, says the October number of "Citrus Leaves" that while California is accredited with raising between 6,000,000 and 7,000,000 boxes of lemons annually, this is not sufficient for domestic consumption, and lemons must be imported into the United States. Prior to 1894, Florida shipped about 150,000 boxes, but the freeze of 1894-1895 killed her trees and she has not replanted to this variety of citrus. Spain produces about 300,000 boxes of lemons annually, but these are consumed locally. About 7,000,000 boxes of lemons are exported from Italy each year, which places her in the lead as far as the production of this fruit is concerned. Palestine, Australia, South Africa, Sicily and some of the other smaller countries barely produce enough for their own use.

Culinary Pea Trials at Ben Lomond.

MARK H. REYNOLDS, H.D.A., Senior Agricultural Instructor.

DURING the past season Mr. J. W. Jay, of Ben Lomond, conducted a culinary pea variety and fertiliser trial in co-operation with the Department. The plots were located on a light-red medium basaltic loam. Peas had been grown on the land the year previously, followed by potatoes, both crops being unfertilised.

The land was ploughed 4 inches deep during the first week in August, very little moisture being present at the time. It was harrowed on 6th August, and drills opened up 30 inches apart soon after. The seed was sown on 6th October, the fertiliser being spread by hand along drills. The seed was covered by a harrowing.

The rate of seeding ranged from 85 to 132 lb. per acre. Buffer rows, unfertilised, were left on either side for purposes of comparison. P 11 was the only fertiliser tried, and it was applied at the rate of 264 lb. per acre. Subsequent cultivations consisted of scarifying on 31st October, lightly hilling on 15th November, and hilling on 22nd November.

A good germination was obtained, No. 1,106 being the poorest, the stand of this variety being much thinner than the others. No. 1,106 was in bloom 15th November, followed by Richard Seddon, Witham Wonder, and English Wonder on 20th November, and Greenfeast and No. 1,112 on 26th November.

Of the two imported varieties tried, No. 1,106 was the earliest (it was the earliest in the trial); it had good colour, and appeared to be a good carrier. No. 1,112 has the same season as Greenfeast, is soft in shell, and it is doubtful if it would carry a long distance.

The first picking was obtained from No. 1,106 on 12th December, this variety being finished before Christmas. Harvesting of the remaining varieties was carried out on 17th and 23rd January, two pullings being obtained.

The rainfall on the fallow was 82 points, and during growth 1,189 points fell.

The following are the results of the variety trial, fertilised with P 11* mixture at 264 lb. per acre:—

YIELDS of Variety Trials with Culinary Peas.

Variety.	Rate sown per acre.	Acre yield of green pods.	Variety.	Rate sown per acre.	Acre yield of green pods.
	lb.	bus.		lb.	bus.
No. 1,106	104	302	Richard Seddon ...	86	348
Special Greenfeast No. 1	111	372	Greenfeast	111	406
Special Greenfeast No. 2	111	401	No. 1,112	132	416
Witham Wonder ...	86	273	English Defiance ...	99	298
English Wonder ...	85	325			

* P11 consists of 6 parts superphosphate to 1 part sulphate of ammonia.

The unfertilised portion did not yield as well as the fertilised rows, the application of the fertiliser being justified by the increased returns, which more than paid for the cost of the fertiliser.

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Farm Forestry.

V. The Native and Introduced Trees of New South Wales.

[Continued from page 926.]

R. H. ANDERSON, B.Sc. Agr., Assistant Botanist, Botanic Gardens, Sydney, and Lecturer in Forestry, University of Sydney.

Introduced Trees of the Western Slopes Division.

ALL the introduced trees, notably Pepper Tree, White Cedar, Silky Oak, Sugar Gum and Tree Lucerne, included in the Western Plains Division (see pages 770 to 773 of *Agricultural Gazette,* October, 1928) do well on the Slopes. The Tree Lucerne is especially popular as a small windbreak for orchards and gardens and makes good development in many districts. Other trees include the following species:—

Pines (Pinus spp.).

All the Pines commonly grown in New South Wales are dealt with hereunder, irrespective of their occurrence in the Western Slopes Division, as it is of advantage to deal with them as a group.

Species of *Pinus* constitute a very important group of trees, being of especial interest to Australia, the forests of which are so deficient in true softwood trees. Besides yielding softwood timber (for which the great demand of the timber market is to-day) the various species of Pines make excellent windbreaks and shelter belts, and yield valuable by-products in the form of resins, turpentine, and edible nuts. A further advantage is that they will frequently thrive on poor stony soils where other trees will give no remunerative return. On the basalt soils of the Monaro, and on poor soil, such as that commonly found on Hawkesbury sandstone, where the growth of Eucalypts is poor, the various species of Pine frequently make excellent development.

The species described below constitute the main ones grown in this State.

Insignis Pine (*Pinus radiata*).

This is the common Pine so frequently cultivated in many parts of the State, and is too well known to require description. Its rapidity of growth and the ease with which young stock can be established have combined to make it a general favourite. The natural distribution of this species is very restricted, being limited to portion of the Californian coast. The annual rainfall on such areas is low averaging only 18 inches and occurs mainly during the winter months. It is compensated for, however, by the daily fogs which come in from the sea during the summer months. The temperature is also mild and equable.

In Australia this species has made better growth and is more valued than in its native country. It grows very rapidly, is comparatively free from disease, and has been planted almost to the exclusion of other conifers. For its best development it requires a porous, well-drained, moderately fertile and fairly deep soil with a fairly retentive subsoil, very stiff soils being avoided except where the surface drainage is good. On such areas as the Blue Mountains, however, where the rainfall exceeds 40 inches, it will make good development on comparatively shallow soil. Generally speaking, the rainfall should exceed 30 inches, and preferably should fall during the winter months, although in deep retentive soils it will make fair growth where the average rainfall is as low as 20 inches, and appears to stand a summer rainfall climate rather better than some of the Mediterranean Pines.

Native Cherry (*Exocarpus cupressiformis*).
For description of this tree, see *Agricultural Gazette*, December, 1928, page 923.

Although fast growing, it is short-lived, and where conditions are not altogether suitable, frequently dies back at an early age of 15 to 20 years.

It is especially suitable for the Tableland Division, but grows well on the coast and does moderately well in the more favoured portion of the Slopes, especially on cultivated areas. It cannot, however, be regarded as a drought-resistant species, standing less heat and dryness than some of the Mediterranean Pines.

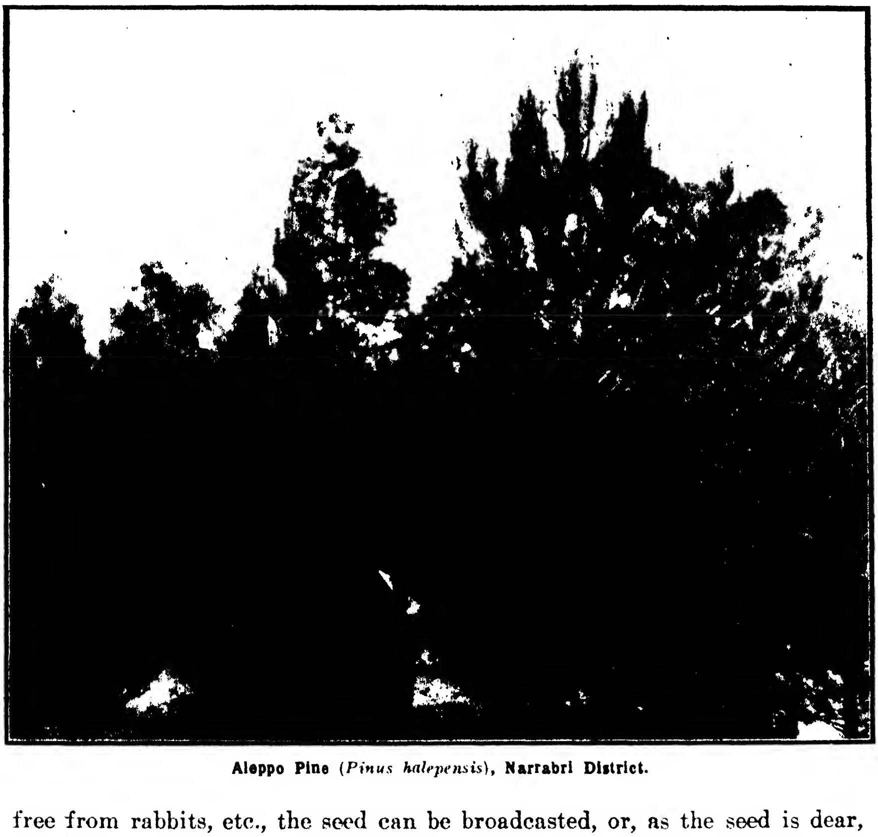
Natural reproduction under favourable conditions is fairly strong, and young stock are easily planted successfully, even when open rooted.

The timber cannot be regarded as a first-class softwood, but is useful for box making and general softwood purposes of the rougher kind. Impregnation with an antiseptic is easy. Recent investigations have shown its suitability for the manufacture of kraft or wrapping paper. It is a good tree for ornamental purposes and for windbreak and shelter belt formations.

CANARY ISLAND PINE (*Pinus canariensis*).

A tree with slender branches forming a broad round topped head. Its native home is the Canary Islands, where it has a wide range from sea level to an elevation of 4,000 feet.

In Australia, together with Insignis Pine, it was one of the first Pines to be planted, and although growing in a fairly large number of localities, has not met with the popularity of Insignis. This is mainly due to the slowness of early growth and the difficulty of transplanting by the open rooted method, young stock requiring fairly exacting treatment of the root system for successful propagation. Young seedlings develop a very pronounced tap root and the only way to successfully establish them is to use containers of some description. The tube method of planting has been used, stock being placed out six to eight months after sowing. On areas



Aleppo Pine (*Pinus halepensis*), Narrabri District.

free from rabbits, etc., the seed can be broadcasted, or, as the seed is dear, spot sown. Unlike the great majority of Pines, it coppices well from the stump. Natural regeneration is also good, although good seed is not produced until the trees are about twenty years old.

It is fairly drought resistant, doing quite well in South Australia with a rainfall of 22 inches, and appears to stand dryness better than Insignis Pine, and is not so exacting in its soil requirements. It is, to some extent, shade bearing, and will grow in amongst Eucalypts, spreading naturally under favourable conditions. It is essentially a winter rainfall tree, although doing fairly well in Queensland with a summer rainfall.

In South Africa it is cultivated to a fairly large extent, being the main high-class Pine, and standing drought better than both Insignis and Cluster Pines, although less frost hardy than those species. In California it frequently grows faster and does better than the native Insignis.

It makes slower growth than Insignis, but is longer lived and the timber is much more valuable, both in quality and strength. In strength the timber of this species exceeds most of the Pines, and compares favourably even with some of the Eucalypts. It is a tree adapted for conditions in portions of the Slopes Division, apart from other districts.

ALEPPO PINE (*Pinus halepensis*).

A tree with short branches, forming a rather open, round topped head, and a native of Mediterranean regions.

It is a moderately hardy species, usually enduring shallow soils better than Insignis Pine, but does best and should be confined to soils containing a fair quantity of lime. It prefers a fairly dry summer with a winter rainfall, and perhaps for this reason is sometimes badly formed or diseased in this State, although doing very well in some districts. In South Australia it is regarded as the hardy Pine, growing moderately well in dry areas of low rainfall. Experience in South Africa has shown it to be very hardy and adapted to shallow soils, but it is planted more for shelter purposes than timber.

It has one of the largest and earliest seeding habits of the Pines. In some of the drier areas in New South Wales trials of this species have not proved satisfactory, but it might do better if raised in containers. In the Slopes Division it has made fairly good growth in such districts as Coonabarabran, Dubbo, Forbes, Wagga, and Albury.

STONE PINE (*Pinus pinea*).

A tree with long, spreading branches, forming a rather broad, flat-topped tree. It is a tree of picturesque habit and rather parasol-like head, and is a native of the Mediterranean regions.

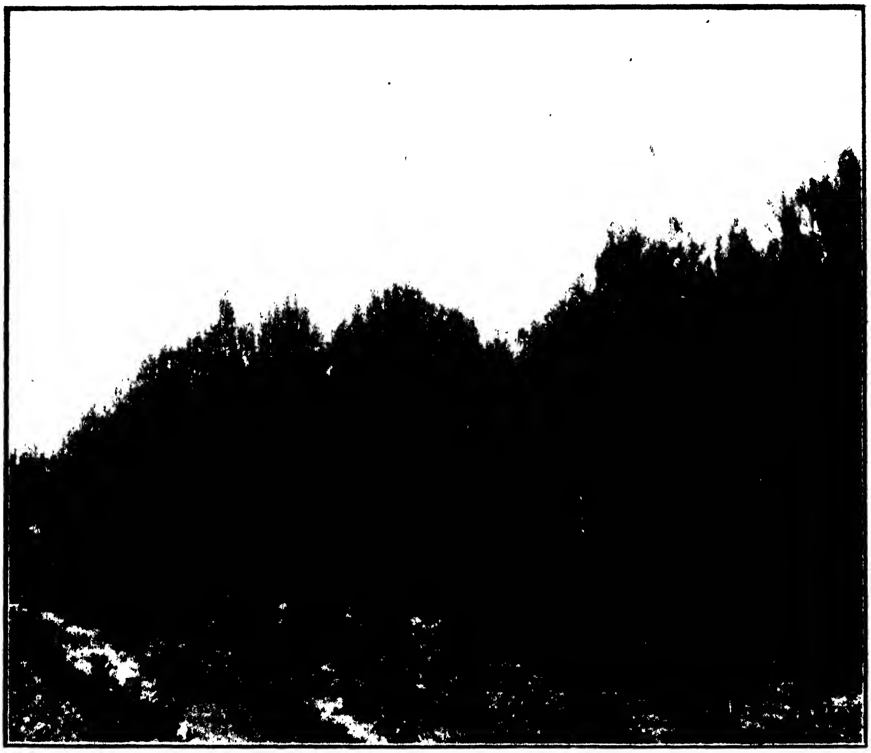
The seed is enclosed in a hard, bony shell and is much sought after for edible purposes, having a fine flavour. This species is fairly hardy and will grow on a variety of soils, including limestone and poor sandy types. Natural reproduction is usually fairly strong.

Where conditions are favourable it forms a dense, widely spreading crown, and is a good tree for planting for shelter and, possibly, the nuts. The timber is whitish and very light. In the Western Slopes Division this species has done moderately well in such localities as Dubbo and Wagga, especially on deep soils or where the roots can find a damp, porous, sandy soil.

CLUSTER PINE (*Pinus pinaster*).

An attractive tree of regular pyramidal habit, and spreading, somewhat pendulous branches. It is a native of the Mediterranean region from Portugal to Palestine, and is cultivated extensively on the sandy areas adjoining the Bay of Biscay, mainly for its very valuable resinous products.

This species will do well on poor sandy soil, and, speaking generally, will do better in the poorer, shallower types than Insignis Pine, and although usually slower, is often safer. Under summer rainfall conditions its development is usually not so good, and perhaps for this reason has failed in parts of the State. It is, however, a good species for planting in sandy soil, especially on the coast, where it can be employed to stop sand drifts, besides yielding valuable products. It has been grown in parts of the Slopes Division.



Cluster Pine (*Pinus pinaster*), Tuncurry District.

YELLOW PINE (*Pinus ponderosa*).

A tree with spreading, frequently pendulous, branches, which often ascend at the ends, forming a narrow, tapering head. It is the most widely distributed Pine tree of the mountainous forest of western North America, and has a number of forms or varieties.

In Australia this Pine does best in the cooler, more elevated portions with a good rainfall, particularly in Victoria and the southern portion of New South Wales. In such districts it grows vigorously on fairly poor soils. Although grown in other Divisions, it would appear to be most suitable for portions of the Southern Tablelands in this State.

Corsican Pine and Austrian Pine (*Pinus laricio*).

This species is very variable, including a number of varieties, the chief being the Corsican Pine and the Austrian Pine.

The Corsican Pine has done moderately well in the eastern States, being healthy, hardy and vigorous, but requiring a fairly good rainfall. Its growth is confined to the coastal and tableland areas. The Austrian Pine appears to do better when away from the coast, but neither species has been grown to any extent in this State.

Pinus longifolia.

An ornamental species, especially in the young stages of growth, developing finally a rather round-topped symmetrical head. It is a native of the Himalayas.

In general appearance it is very similar to the Canary Island Pine, and presents some of the difficulties in propagation of that species. It is perhaps more slow growing than the Canary Island Pine, and is not very frost hardy, but is well worthy of cultivation.

Pitch Pine (*Pinus Coulteri*).

A tree with large, conspicuous, ornamental cones. It is cultivated in the cooler parts of New South Wales, and does moderately well in the Sydney district, but is inclined to be sparse in the foliage.

Long-leaved Pine or Southern Pitch Pine (*Pinus palustris*).

A native of North America and generally recognised as one of the most valuable pines of the Southern States, supplying abundant turpentine, pitch, tar and resin, besides having a very useful timber. Although seldom seen in New South Wales, it appears to do well in parts of the Coastal and Tableland Divisions, and is a subject for further experimental plantings. It appears to require both warmth and moisture.

Pinus Jeffreyi.

An ornamental Pine of symmetrical habit. It is a native of North America, is fairly hardy, and worthy of trial in parts of the Tablelands.

(*To be continued.*)

Co-operation and the Fruit-grower.

One of the chief accomplishments of co-operatives in U.S.A. has been in the field of widening consuming markets and in popularising their brands. No longer is the matter of crop control considered the cornerstone upon which the structure is built. Co-operatives do not stress crop control because they do not exercise a domination of the supply. They know the best way to keep their member is to get top prices for his fruit, and that means efficient management, aggressive selling, and sound merchandising policies.

Liquid Hydrocyanic Acid.

Its Use in Citrus Fumigation.

A. A. RAMSAY, F.C.S., F.A.I.C., Chief Chemist.

Under ordinary conditions of temperature and pressure hydrocyanic acid is a gas, but when subjected to a sufficiently low temperature, even without pressure, it may be condensed to liquid form. Hydrocyanic acid in liquid form was first used for the destruction of scale insects about 1915, and in 1917 the first plant for the manufacture of liquid hydrocyanic acid on a commercial scale was erected by Owl Fumigating Company at Azusa, in California.

The process of manufacture was comparatively simple. The hydrocyanic acid gas, produced in generators from the interaction of sodium (or potassium) cyanide, sulphuric acid and water, was conducted into numerous flues or tubes surrounded by brine from a refrigerator plant. The first product, which contained considerable water, was then distilled, which separated most of the hydrocyanic acid from the water, yielding a product containing 95 per cent. or over hydrocyanic acid. The yield from 200 lb. sodium cyanide (51 to 52 per cent. cyanogen) was 14.8 gallons (86 lb.) of liquid hydrocyanic acid. As the total weight of anhydrous hydrocyanic acid in 200 lb. sodium cyanide used was 108 lb., a high recovery was not obtained. In two trial runs using 3,400 lb. sodium cyanide, 80.1 per cent. and 76.3 per cent. of the theoretical yield of hydrocyanic acid were obtained. The acid obtained in the first trial was of 97.6 per cent. purity and in the second trial of 94.3 per cent. purity.

At this date those purporting to fumigate purchased their own sodium cyanide; the Owl plant furnished the sulphuric acid and generated and liquefied the hydrocyanic acid at a fixed charge per 200 lb. sodium cyanide. The liquefied hydrocyanic acid was transported to the field in suitable containers and transferred to an atomising machine, which consisted essentially of a holding tank, a graduated cylinder for measuring the dosage in a pump, and spray nozzles for atomising the liquid. The tree to be treated was covered with a tent, and the hydrocyanic acid atomised and delivered under the tent.

Present Methods of Manufacture.

In the subsequent development of the liquid hydrocyanic acid industry, the product was manufactured by certain firms from sodium cyanide and also from crude calcium cyanide. The type of plant now in use consists essentially of—(1) a generator constructed of steel, the interior being lead lined; (2) a condenser in the shape of a boiler containing tubes through which the gas passes and which is surrounded by cold brine, one condenser being required for each generator; (3) a distiller in the shape of a drum surrounded from the outside by a steam jacket to raise the temperature and evaporate the liquid hydrocyanic acid, leaving behind the excess

of water. Steam and refrigerating plant is also required. Special storage tanks are provided in which the liquid hydrocyanic acid is kept at a low temperature. The acid is afterwards put up in small containers holding 80 lb. for distribution. It is difficult to obtain figures of production costs, but it is believed the cost at the factory is about 2s. 5d. per lb.; the retail price is about 2s. 6d. to 2s. 11d. per lb.

The liquid hydrocyanic acid is applied under the fumigation sheets or tents by means of specially-constructed "atomisers" which apply the liquid hydrocyanic acid in its liquid form, or by "vaporisers" in which the liquid hydrocyanic acid is converted into warm gas outside the tent by being passed into a coil surrounded by hot water or heated by exhaust gas of an automobile. The idea of applying the gas by means of the vaporiser is based on the good results of fumigation by means of the pot method, it being thought that the diffusion of warm gas was quicker than if the dosage of liquid hydrocyanic acid was discharged in the cold. Atomisers cost from £16 to £21; vaporisers cost about £72 (the "autofumer" costs £165 to £200).

The Stability of the Liquid Acid.

Liquid hydrocyanic acid is not very stable, and even at cold temperatures decomposition may take place; most impurities tend to accelerate the decomposition. If the liquid is confined in a container, and decomposition occurs, gases are liberated which, if not allowed to escape, will often develop sufficient pressure to burst the container. Some samples decompose completely within a few days or weeks. One apparently good sample is recorded as having decomposed completely in forty days, while another sample of similar appearance, kept under same conditions, was as good at the end of four months as at first.

Some of the factors which influence keeping quality have been studied, but the ensuring of keeping quality is still one of the problems in connection with the extensive use of liquid hydrocyanic acid for fumigation.

The Diffusion of the Gas.

When the liquid hydrocyanic acid has come in contact with fruit or foliage, severe burning has occurred, and in the case of low-hanging fruit this feature is of some consequence. When hydrocyanic acid is applied in the form of atomised liquid hydrocyanic acid vaporisation takes place near the ground and the gas formed rapidly diffuses up, whereas the gas produced when the pot method of fumigation is used goes quickly to the top of the tent and gradually diffuses down. The gas from the liquid hydrocyanic acid is most effective at the bottom, next at the centre, and least effective at the top of the tree, whereas with the pot system, there is little difference in effectiveness between the top and centre portions, and but a slight decrease at the bottom.

Californian Experience with the Liquid Acid.

Fumigation is carried out in California by two main systems, viz., the contract system, in which the equipment is owned by individuals or firms which agree to fumigate orchards, supplying chemicals, labour, &c., at a

certain rate; and the association system, in which a number of growers unite on a co-operative basis, the work being controlled by a manager elected from the members, and the cost to members being only actual cost of performing the work.

No crew or brigade can work unless its foreman is in possession of a license, which must be renewed every year, and in the event of unsatisfactory work the license is cancelled and not renewed. Each of the brigades has its own specially-constructed lorry to carry all equipment from orchard to orchard and especially to carry the liquid hydrocyanic acid from the local depots or stores to the orchard in the evening, and to return the liquid acid to the stores after the night's work is finished. In each of the stores provision is made for keeping the containers cool; the best temperature for safe storage is 60 degrees Fah. (15.5 deg. C.). Since liquid hydrocyanic acid boils at 26 degrees C., an increase of temperature is a very real danger, and might easily result in the bursting of the container. As, however, the citrus orchards in California are mostly planted on hills far from centres of population, the danger from bursting would be limited to the fumigating staff.

The results of fumigation with liquid hydrocyanic acid in California, up to 1920, were not entirely satisfactory—the work in certain districts was particularly poor—and dissatisfaction arose. In 1921 the pot method was again largely employed, but recent improvements in the machines used to apply the liquid acid, and the possibility of more accurately controlling the dosages to the trees have, it is stated, led to a more extended use of liquid hydrocyanic acid. The objection to the pot method is that the equipment—tents, pots, and chemicals—is cumbersome; its transport from place to place is tedious and costly, and the destruction of tents and sheets from the splashing of acid is considerable. The advantages of the pot system are that it is simple and can be carried out by labourers of ordinary intelligence—no special skill is required in handling chemicals, and dosages can be checked even after chemicals have been mixed, whereas when liquid hydrocyanic acid is used no such check on the dosage given is possible.

The cost of fumigating small trees from one to three years old, using liquid hydrocyanic acid is stated to be about 10d., and of big trees 4s. 1d. to 5s. 2d., the average cost being from 1s. 5d. to 1s. 8d.

Infectious Diseases Reported in November.

The following outbreaks of the more important infectious diseases were reported during the month of November, 1928:—

Anthrax	11
Blackleg	3
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia contagiosa	17
Swine fever	1
Contagious pneumonia	1

—Max Henry, Chief Veterinary Surgeon.

E

A Covered Pit for the Disposal of Waste Fruit.

T. McCARTHY, Senior Assistant Entomologist.

One of the most useful methods of controlling fruit flies and codling moth is the destruction, by boiling, burning, or burying, of all fallen and infested fruit as required by the regulations under the Plant Diseases Act.

In some districts lack of adequate supplies of firewood is a very real difficulty, and if growers in those districts attempt to burn their waste fruit —stone and pome fruits, in particular, are very difficult to burn, and require large quantities of firewood—the results are very often unsatisfactory; the fruit is incompletely burned, and living pupae have been found in the soil under heaps of the partly charred fruit, although the growers in such instances were quite content that they had satisfactorily burned the fruit and destroyed all the pests it contained.

In other cases there are growers who dispose of waste and infested fruit by dumping it into running creeks, believing that the maggots will be destroyed. Others consider that the feeding of the fruit to pigs is an efficient and economical way of getting rid of it, but they overlook the fact that some of the fruit will remain sufficiently long on the ground to allow the caterpillars or maggots to escape. Similarly, burying the fruit may also become a menace, especially where irresponsible labour is employed, if the fruit is not covered with a sufficient depth of soil to prevent the flies or moths from making their escape.

Believing that an easier and more efficient method of disposing of waste fruit would lead to better control of pests, the writer conceived the idea of a pit dug in a convenient position in the orchard and covered with an insect-proof framework. The grower could then collect the waste fruit from the orchard and dump it through a self-closing trap door in the framework into the pit, where it requires no further attention. Being insect proof, flies or moths emerging after the fruit has been dumped are imprisoned and eventually die.

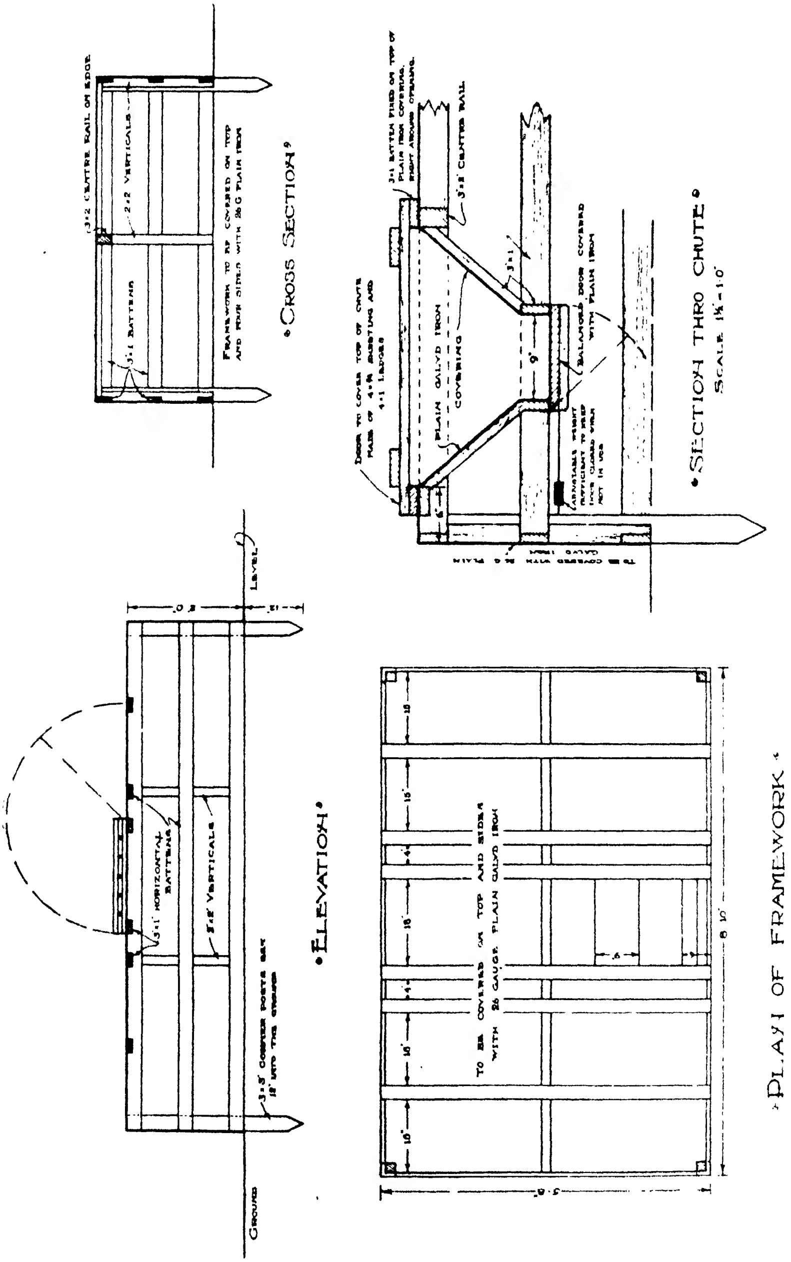
The practicability of the idea was tested at Bathurst Experiment Farm during the 1927-28 season, and found to be entirely satisfactory. As a result the matter was submitted to Mr. N. L. Jones, the Department's Supervising Architect, and he prepared the accompanying plans and specifications of a very effective type of insect-proof pit cover, largely based on his own suggestions.

Specifications for Pit Cover.

The cover for the pit consists of a framework made of hardwood, and covered on the outside with 26 gauge plain galvanised iron. By making it 8 feet 10 inches long and 5 feet 8 inches wide, the plain iron, which is purchased in sheets 6 feet long, may be used to its best advantage.

The framework should be constructed with 3 x 3 inch corner posts 3 feet long, pointed at the ends to facilitate driving into the ground. To each

side and end put three battens of 3 x 1 inch sunk flush into the outer face of the corner posts, spaced 7½ inches apart, and making a total width of 24 inches. The battens on each side are to be supported by two verticals of 2 x 2 inches, and the ends by one vertical, notched out over the battens. On the top in the centre of the frame, as shown on the drawings, put a



Plan, Elevation, and Sections of Pit Cover.

3 x 2 inch rail, and set the six 3 x 1 inch battens at the distances shown, let into both the centre and outside rails. All joints throughout to be securely nailed. On either side of the opening for the chute fix two 3 x 1 inch battens, tenoned into top and middle side rails. The cross-pieces at the top are to be set on flat and at the bottom to be on edge, set 9 inches apart. The sloping sides of the chute are to consist of 3 x 1 inch battens cut to fit in between the rails, as shown on the section—two to each side.

The door at the bottom of the chute is to be of wood, in one piece, with cleats fixed to the underside. To be covered with plain galvanised iron, so that the juice from the fruit will not have a tendency to cause the wood to swell and warp. To the underside of the door fix a piece of flat iron, say 1 inch wide by ¼ inch thick, screwed on and projecting 10 or 11 inches beyond the door. The projecting end to have holes drilled in it, so that the weight shown on the drawing can be bolted or wired at any convenient position. The weight to consist of any suitable scrap iron, but to be sufficiently heavy to securely close the door. The door is to be hinged with butt hinges to the 3 x 1 inch cross rail, as shown on the drawings.

Cover the four sides and top of the framework, also the four sides of the chute, with 26 gauge plain galvanised iron, fixed to the battens with ¾ inch galvanised clouts. The sheets of iron are to be lapped at the joints, and all the joints are to be soldered. After the iron has been fixed, put a 3 x 1 inch batten right round the opening at the top of the chute, and turn the iron up against the inside edge of the battens and securely fix same with galvanised clouts.

The door to the top of the chute is to be made of 4 x ¾ inch T. and G. boarding fixed to 4 x 1 inch ledges, and hinged to open sideways with 3 inch butt hinges.

Materials Required.

The quantities and prices of materials required for construction of the fruit pit cover are given below. The prices quoted are all f.o.b. or f.o.r. Sydney, as at 1st December, 1928:—

				£	s.	d.
4/3′	3″×3″	Hardwood for corner posts ...	12′ @ 25/2 per 100′	0	3	1
16/6′, 6/9′	3″×1″	Hardwood for horizontal rails...	150′ @ 7/5 per 100′	0	11	2
1/9′	3″×2″	Hardwood for centre rail ...	9′ @ 15/6 per 100′	0	1	5
6/2′	2″×2″	Hardwood for verticals ...	12′ @ 11/10 per 100′	0	1	6
20 ft.	3″×1″	Hardwood to cut trimmers to chute	20′ @ 7/5 per 100′	0	1	6
2 ft.	12″×1″	Hardwood for balanced doors	2′ @ 75/- per 100′	0	1	6
2 ft.	2″×1″	Hardwood for balanced door cleats.	@ 4/11 per 100′	0	0	2
7/3′	4″×¾″	T. and G. flooring for door to top of chute	21′ @ 13/4 per 100′	0	2	10
4 ft.	4″×1″	Ledges to door to top of chute	@ 12/- per 100′	0	0	6
2 prs.	3″	Butt hinges	@ 5d. ...	0	0	10
18″	1″×¼″	Plain iron lever to balanced door	....	0	0	9
5 sheets	6′×2′	26 gauge plain iron to four sides	@ 2/7 ...	0	12	11
3 sheets	6′×3′	26 gauge plain iron to top ...	@ 3/11 ...	0	11	9
1 sheet	6′×3′	26 gauge plain iron sides of chute and for covering door ...	....	0	3	11
1 lb. ...	¾″	Galvanised clouts	....	0	1	0
1 lb. ...		Nails	....	0	0	6
2 lb. ...		Solder and spirits of salts ...	....	0	4	0
		Total Cost		£2	19	4

The pit should be dug 6 inches shorter and 6 inches narrower than the cover in order to allow the latter to overlap the pit about 6 inches. The depth of the pit will depend entirely upon the requirements of the orchard concerned, but a pit 8 feet deep will take approximately 260 bushel cases of waste fruit. In larger orchards two pits may be necessary. When all the waste fruit has been placed in the pit, the framework can be allowed to remain in position until the following season, by which time the fruit will have rotted and sunk considerably. If there is not enough space to take the waste fruit of the next season the cover can be removed to a fresh pit and the old one filled in.

As an additional precaution it is advisable, after the four pointed corner posts have been placed in the ground, to heap up the soil to a height of about 6 inches around the cover, to prevent any possibility of moths or flies escaping.

TUBERCLE-FREE HERDS.

OF the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number tested.	Expiry date of this Certification.
Kinross Bros., Minnamurra, Inverell (Guernseys)	77	5 Jan., 1929
Mr. Stanton, Leicester Park, Mittagong	63	6 ,, 1929
Department of Education, Yanco Agricultural High School	34	12 ,, 1929
New England Girls' Grammar School, Armidale	17	12 ,, 1929
Department of Education, Eastwood Home	16	16 ,, 1929
Lunacy Department, Rydalmere Mental Hospital	63	25 ,, 1929
Lunacy Department, Callan Park Mental Hospital	20	26 ,, 1929
Miss Brennan, Arrankamp, Bowral	24	29 ,, 1929
A. E. Collins, Hazelhurst Dairy, Bowral	13	8 Feb., 1929
A. V. Chaffey, "Lilydale," Glen Innes	16	14 ,, 1929
Lunacy Department, Kenmore Mental Hospital	99	17 ,, 1929
Tudor House School, Moss Vale	6	22 ,, 1929
Lunacy Department, Orange Mental Hospital	3	22 ,, 1929
William Thompson Masonic School, Baulkham Hills	29	23 ,, 1929
Australian Missionary College, Cooranbong	57	24 ,, 1929
Department of Education, Hurlstone Agricultural High School ...	33	1 Mar., 1929
J. F. Chaffey, Glen Innes (Ayrshires)	58	2 May, 1929
F. W. Hopley, Leeton	25	14 ,, 1929
P. F. Mooney, Calala	33	16 ,, 1929
Department of Education, Gosford Farm Homes	16	16 ,, 1929
E. P. Perry, Nundorah, Parkville (Guernseys)	26	12 June, 1929
Dominican Convent, Moss Vale	4	26 ,, 1929
Sacred Heart Convent, Bowral	10	21 July, 1929
St. Patrick's College, Goulburn	8	26 ,, 1929
Presbyterian Ladies College, Goulburn	4	26 ,, 1929
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	42	9 Aug., 1929
Kyong School, Moss Vale	2	21 ,, 1929
Department of Education, Mittagong Farm Homes	29	23 ,, 1929
Blessed Chanel's Seminary, Mittagong	4	25 ,, 1929
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	75	25 ,, 1929
Walaroi College, Orange	5	30 ,, 1929
Riverstone Meat Co., Riverstone Meat Works, Riverstone	120	5 Sept., 1929
J. L. W. Barton, Wallerawang	22	11 Oct., 1929
Lunacy Department, Morisset Mental Hospital	21	7 Dec., 1929
J. Davies, Puen Buen, Scone (Jerseys)	38	12 ,, 1929

—MAX HENRY, Chief Veterinary Surgeon.

The Bacon Pig.

A. F. GRAY, Senior Piggery Instructor.

No better advice can be tendered primary producers than to urge upon them the importance of producing exactly in accordance with market requirements. The fact that the market requires a certain class of product means that there is a demand on the part of the consuming public for that particular article in preference to all others, and consequently the producer, whether he be engaged in the primary or secondary industries, who makes it his business to supply in accordance with that demand, will be assured of payable returns for his labours. The advice is sound for all branches of industry, but in this particular article it is given for the guidance of breeders of pigs for the bacon trade.

The present-day task of meeting the requirements of the bacon-curer, the retail merchant, and the consumer, is a much more difficult undertaking than it was some years back. Keener competition, both in the local and overseas markets, and a more discriminating taste—in fact, a complete change of taste—on the part of the consumer, have made it necessary for breeders of bacon types of pigs to pay the greatest attention to details when it comes to a question of supplying just what the bacon manufacturer considers the best bacon pig. And the breeder cannot afford to ignore the manufacturer's ideas as to what is required, as, being in closer touch with consumers, he is best able to sum up the likes and dislikes of buyers.

Good Breeding Stock Essential.

The idea is fairly prevalent that any breed or cross-breed will fill the bill as a baconer, provided it is well fed and cared for. This is a mistaken idea, as the pig now in demand for bacon production cannot be produced other than by breeding along definite lines. And in this respect great care must be taken to breed only from pigs conforming to the ideal type, and which are known to be from healthy, vigorous, hardy, early-maturing strains. The production of such a type of pig requires judgment in the selection of the breeding stock. Moreover, a big factor in the success of the venture is the amount of intelligent interest taken in the work by the individual who actually carries out the work involved in the care and management of the animals. He must know his job and do it thoroughly, keeping in mind at all times the chief aim of the undertaking, namely, to produce a quality product, in the shortest time, and at the lowest cost.

The chief points of the ideal type of baconer should be visualised by the breeder at the outset, and, with the desirable characteristics clearly defined in his mind, he is better able to choose his breeding stock with the idea of reproducing in the offspring just the qualities desired. Perhaps

it is unnecessary to remark that a dam or sire displaying a weakness in any particular direction should be avoided, because any such defects will be accentuated in the progeny. By careful selection and attention to the foregoing details, qualities which have a definite commercial value, such as prolificacy, good quality flesh, quick fattening tendencies, lightness of bone and offal, are certain to be exhibited in the progeny.

The Principal Breeds.

Any argument advanced in favour of a particular breed as producing the best type of bacon would not be at all convincing unless the reasons for rejecting other breeds were also given. Therefore, the merits and demerits of the principal breeds are given briefly hereunder:—

Berkshires.—This is a dual-purpose breed, being suitable for either bacon or pork, and quite adapted to the climatic conditions of this State. The pure-bred Berkshire, however, is inclined to be rather too fat and heavy to be considered as ideal for the bacon trade.

Tamworths.—The Tamworth is essentially a bacon type, and is successfully used for crossing with Berkshires and other breeds for the purpose of increasing the length and depth of side.

Middle Yorkshires.—Like the Berkshire breed, the Middle Yorkshire is a dual-purpose breed, but can be successfully kept only when conditions as to shade and shelter are rendered suitable, as the breed is subject to sun scald unless care is exercised. And this is one of the reasons why they are less popular than the Berkshire.

Poland Chinas.—Essentially this is a pork and lard producing pig, and cannot be recommended as a baconer. When mated with Berkshires the resultant cross is an excellent quick-maturing porker.

The other breeds, which include British Large Blacks, Gloucestershire Old Spots, Duroc Jerseys, and Large Yorkshires, each have their particular admirers, but for our present trade requirements it is considered that the ideal bacon pig is either the Tamworth-Berkshire cross or the pure-bred Middle Yorkshire.

The Ideal Bacon Type.

The ideal bacon pig should have a carcase showing full development in the high-priced cuts, and the flesh should be firm and of a good colour, with hard white fat. The animal should have a roomy chest giving plenty of heart and lung space, straight shoulders (not heavy or coarse), a strong muscular back of even width throughout its full length, with the ribs well sprung out from the backbone, but giving straight sides, long and deep and in alignment with the shoulders and hams. The tail should be well set on and rather high up, the hams should be full and shapely, with flesh to the hocks; the belly should be firm and straight in the underline, and the flanks should exhibit a fullness. The legs should be clean and flat-boned, and the pig should stand four square on its toes.

Knowing what is required, the problem resolves itself into breeding along lines that will produce an animal possessing all, or most of, the desirable characteristics. It is considered that the best type of sow for use in bacon production is produced by mating pure Tamworths and Berkshires, and then selecting from the progeny sows possessing the desired qualities. These selected cross-bred sows are then mated with pure-bred Berkshire boars, the offspring from this cross meeting the demand for a mild cured, tender, lean, juicy bacon. Under normal conditions, young pigs from this mating can be marketed when six months old, at which age the dressed weight of the carcase should run from 90 to 130 lb.—a desirable weight from the bacon factory's point of view.

The Middle Yorkshire boar can be used with advantage on cross-bred sows in particular districts and under suitable conditions, and the progeny of such a mating is also a high-class bacon pig.

Fitting the Pig for Market.

In fitting the bacon pig for market, it should be kept growing all the time, but not allowed to get overfat. During the last four to six weeks before marketing it should be penned and got into condition for slaughtering for bacon production.

The grazing of pigs on open pasture is beneficial and allows of the animals getting sufficient exercise, but generally it will be found necessary to supplement the natural pasturage with other foodstuffs. Pigs will do exceptionally well on good mixed pastures, provided adequate shelter is provided, but it is always a good plan, as suggested above, to confine them to the fattening pens for from four to six weeks prior to marketing.

Nor are the breeder's worries at an end when the pigs are despatched to market. Of course, they should have been fire-branded before trucking, but the point it is desired particularly to stress is the financial losses sometimes occasioned by bruising of the flesh of the animals caused by careless and rough handling in transit. Extensive bruising and cuts are not uncommon on pigs that have been trucked, and these defects certainly do not increase the market value of the animals. A little thought and care in this direction may make a considerable difference in your market returns.

Apple Marketing Methods Adopted by Canada.

THE apple growers in British Columbia, Canada, elated over a crop one-third better than in 1927, are using new methods to market apples. Service stations for distribution are being set up in important markets, and cartons containing six or twelve apples will be kept in these stations for purchasers in small volume. Slot machines will be used to peddle apples at five cents apiece. The British Columbia growers may even reach out for neglected markets in Denmark, Sweden, Norway, and other European countries.

Lambs' Tails (*Boussingaultia baselloides*).

A Reputed Poisonous Climber.

H. R. SEDDON, D.V.Sc., and W. L. HINDMARSH, B.V.Sc., M.R.C.V.S., D.V.H.*

Our attention was first called to this plant by the appearance of a news item in the daily press in which it was alleged that persons had been poisoned by drinking water in which the branches of this climber had been soaking. The plant in question is a luxuriant climber, which is grown at times over tanks and outhouses, and it would thus be an easy matter for the pendulous branches to hang down on the inside of an open tank over which it was trailing.

The somewhat startling news caption, therefore, interested us, as it is possible that stock may gain ready access to the plant, and as there appeared to be no definite information as to its toxicity, it was deemed advisable to test it at the earliest opportunity. Supplies of the plant from two sources were tested. The first was obtained by the courtesy of Mr. H. Finnemore, of the Pharmacy Department of the University of Sydney, and the second, from plants growing at Liverpool (comparatively close to the Veterinary Research Station), was drawn upon to a greater extent, as we were thereby assured of ample supplies of the freshly gathered plant. The identity of the plant used was kindly confirmed by the Director of the Botanic Gardens.

Experiments with Cattle.

1. A steer, 2½ years old, was offered 12 lb. of the creeper (in flowering stage) but none was eaten. On the day following the plant was cut up and mixed with chaff. During the day 21 lb. of the plant was eaten.

Result.—No ill effects were noted.

2. A steer, three years of age, was offered 8 lb. of the plant (in flowering and early seeding stage, freshly cut) and ate 2 lb. Later in the same day it ate 8 lb. mixed with chaff. During the seven succeeding days it ate the plant readily, at first with a little chaff, but during the last four days the creeper was the sole article of diet. During this period of eight days 280 lb. of the plant was eaten.

Result.—No ill effects were noted.

Experiments with Sheep.

1. Four pounds weight of the freshly cut plant (in flower and early seed) was soaked in 1 gallon of water for three hours, and a seven-year-old sheep was drenched with 1 pint of the fluid. No ill effects were apparent during the succeeding twenty-four hours, but the sheep was permitted to drink only

* A research undertaken under the Poison Plants Committee of the Commonwealth Council for Scientific and Industrial Research.

water in which the plant was soaking (4 lb. of plant to each gallon of water). As the sheep readily drank this water, the procedure was followed for six days.

N.B.—The plant was rapidly decomposed in the water and fresh supplies were placed in the trough each morning, the plant being allowed to steep during the subsequent twenty-four hours.

Result.—No ill effects were noted.

2. Four pounds weight of the freshly cut plant (in flowering and early seeding stage) was minced and steeped in 4 pints of water for twenty-four hours. The fluid was then pressed out and 2½ pints of the expressed liquid was given to a two-year-old sheep as a drench, at about 11 a.m. in the morning.

Result.—During the afternoon the sheep passed some rather liquid fæces. Otherwise the animal remained normal.

Experiments with Pigs.

1. Two pounds weight of the freshly cut plant (in flower) was minced, mixed with milk, and offered to a pig. The pig refused to eat it until the following afternoon, when, on the addition of some pollard, it was consumed. On the succeeding day 2 lb. of the plant, mixed with pollard, was again eaten.

Result.—No ill effects were noted.

2. Four pounds weight of the freshly cut plant (in flower and early seed) was steeped in water for three hours. A pig, 79 lb. in weight, was drenched with 1 pint of the fluid. No ill effects being noted as a result, 4 lb. of the plant was steeped in water overnight and the fluid decanted. This fluid was then mixed with pollard and fed to the same pig. This procedure was continued or six successive days.

Result.—The pig showed slight diarrhœa on the fifth day, but was normal again on the sixth day. No other ill effects were noted.

Conclusions.

1. To cattle not accustomed to the plant it may at first be distasteful.

2. The only ill effect produced in these experiments has been a transient looseness of the bowels in a sheep and a pig. In the case of the pig this occurred after water in which the plant had been steeped was given, along with the food, for five days. In the sheep, it occurred after drenching with an aqueous extract of the plant.

3. Whilst the above may be taken as showing conclusively that the plant is not to be regarded as a poisonous one, the fact that when soaked in water it leads to the water becoming very slimy, and of such a nature as to become unpalatable and offensive to drink, places the plant in a category which renders it an undesirable one to grow in a situation where it may foul the water supply.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36A, G.P.O., Sydney, not later than the 12th of the month.

Wheat—

Aussie	J. Parslow, Balladoran.
Bena	E. J. Johnson, Wongalea.
	B. J. Stocks, Cunningar.
	W. W. Watson, Tichborne.
Canberra	J. Parslow, Balladoran.
	H. J. Harvey, Dubbo.
	E. J. Johnson, Wongalea.
	B. J Stocks, Cunningar.
	W. W. Watson, Tichborne.
	Manager, Experiment Farm, Condobolin.
Federation	W. Glenn, Thyra Road, Moama.
	H J. Harvey, Dubbo.
	E. J. Johnson, Wongalea
	B. J. Stocks, Cunningar.
	W. W. Watson, Tichborne.
Merredin	T. W. O'Brien, Junee Reefs.
Nabawa	Cullen Brothers, Dubbo.
	H. J. Harvey. Dubbo.
	T W. O Brien, Junee Reefs
	T. R. Sharp, Aberfoyle, Forbes.
Riverina	Cullen Brothers, Dubbo.
Turvey...	B. J Stocks, Cunningar.
	W W. Watson, Tichborne.
Union	W. Glenn, Thyra Road, Moama
Wandilla	H. J. Harvey, Dubbo.
Waratah	R. O. Stiles, Narromine.
	W. Glenn, Thyra Road, Moama.
	E. J. Johnson, Wongalea.
	T. W. O'Brien, Junee Reefs.
	B. J Stocks, Cunningar.
	G. T Troy, Bland, via Quandialla.
	Wallder Brothers, Tullibigeal.
	W. W. Watson, Tichborne.
	Manager, Experiment Farm, Condobolin
Yandilla King...	R. O. Stiles, Narromine.
	H. J. Harvey, Dubbo.
	B. J. Stocks, Cunningar.

Oats—	
Algerian	C. Bennett, Forbes Road, Cowra.
	T. W. O'Brien, Junee Reefs.
Belar	C. Bennett, Forbes Road, Cowra.
Mulga	C. Bennett, Forbes Road, Cowra.
Japanese Millet	Manager, Experiment Farm, Coonamble.
Sudan Grass	C. Bennett, Forbes Road, Cowra.
Sweet Sorghums—	
White African	Under-Secretary, Department of Agriculture,
Saccaline	D. P. Shearer and Sons, Glendon, Scott's Flat, Singleton.
Collier	Manager, Experiment Farm, Grafton.
Cowper (late Selection No. 61)	Manager, Experiment Farm, Grafton.
Tomatoes—	
Sunnybrook Earliana	A. E. Johnson, Green Valley, via Liverpool.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

SWEET SORGHUM TRIALS, NARRABRI DISTRICT, 1927–28.

A VARIETY trial was conducted on the property of Mr. E. A. Richards, Narrabri Creek, Narrabri, during 1927-28. The varieties included in the trial were Sumac, Saccaline, Cowper, White African, Gooseneck, and Collier.

The trial was sown on 24th December, 1927, in rows 3 feet 6 inches apart at the rate of 5 lb. per acre. The soil used was a light semi-alluvial loam, and the initial working was done with a disc plough in October, followed by the springtooth cultivator early in December. The plots were harrowed after sowing.

The germination was excellent and the rains during the summer months, combined with warm conditions experienced, promoted a rapid and vigorous growth. Sumac attained a height of from 6 to 8 feet in eleven weeks, and at that time was well in head. The average height of all varieties was from 8 to 11 feet. They commenced to head in the following order:—Sumac, 54 days; Cowper, 64 days; Saccaline, 74 days; Collier, 76 days; White African, 76 days; and Gooseneck, 92 days.

Rainfall for the four months, December to March, totalled 2,093 points, being distributed as follows:—December, 698 points; January, 211 points; February, 697 points; March, 487 points.

TABLE of Yields.

Variety.	Yield per acre.		
	t.	c.	q.
Collier	21	3	0
Saccaline	20	4	2
White African	19	11	0
Cowper	19	4	1
Gooseneck	18	2	2
Sumac	9	2	1

J. A. O'REILLY, Agricultural Instructor.

Orchard Notes.

January.

C. G. SAVAGE AND W. LE GAY BRERETON.

Cultivation.

CARE should still be taken during this month to keep down weed growth and to maintain a dry soil mulch. As has been explained in previous "notes," the choice of implements for this work depends on the condition of the soil, and there is no need to go into detail again concerning this aspect of orchard cultivation, although it may be mentioned that the plough leaves a better mulch than the cultivator. There are two reasons for this: firstly, the mulch left by a plough allows any rain that falls to soak in more readily; and secondly, it is not so quickly destroyed by showers. It is important that the soil close in under the trees, which cannot be reached by the horse implements, be worked with hand tools.

The cultivation of hillsides presents one of the most difficult problems of orchard management, as some weed growth is necessary to check the soil being washed away during heavy rains, yet at the same time this weed growth must be checked sufficiently to prevent its robbing the trees of too much moisture and available plant food. An article on the cultivation of orchards, by Mr. H. Broadfoot, Senior Fruit Instructor, was published in the November issue of the *Agricultural Gazette*, and readers are referred back to that article for further details on the subject.

The practice of green manuring should be limited to districts where the normal rainfall is more than sufficient for the trees, or where irrigation can be practised. In other cases green manure crops will rob the trees of too much moisture, except in abnormally wet seasons. Where it is intended to sow such crops, preparation should be made towards the end of this month or early in February. Often it is necessary to plough before sowing. Either field peas or tick beans are suitable leguminous crops for this purpose. They should be sown with about 1 cwt. superphosphate per acre or a mixture of ½ cwt. superphosphate and ½ cwt. blood and bone.

Summer Training and Budding.

Periodical inspections should be made of young trees or trees that have been reworked within the last two or three years, and any necessary attention given as directed in these "notes" of November last.

Provided the sap is flowing freely in the stock, January is a good month to carry out budding of both pome and stone fruits.

Pests an Diseases.

The young white wax scale is generally showing on the foliage and young shoots of citrus trees at this time of the year, and if sprays are to be used for its control they should be applied before the young wax scale has developed a heavy covering of wax. Of course, where it is proposed to fumigate the trees not later than early in February for red or black scale, there will be no need to apply a spray for the wax alone.

In treating all scale insects on citrus trees it is important to watch the development of the scale closely at about this period, and time the treatment accordingly.

Codling Moth.

There is every indication in some districts that this pest will be very troublesome this season, and growers will need to put up a continual fight to keep it under control. The methods of control have been described in these "notes" from time to time; but, if readers cannot turn up these references, they can obtain the information in leaflet form from the Department of Agriculture, Box 36A, G.P.O., Sydney.

Zig-zag Tillage in Orchards.

To keep an orchard in a healthy growing condition one of the most essential operations is cultivation. During a wet season it is necessary to cultivate as often as weather will permit in order to keep weed growth under control, and during a dry season to conserve moisture.

The most efficient and economical method of cultivation adopted at Glen Innes Experiment Farm orchard is what might be called the "zig-zag diagonal" method. By using such a method both ways and with careful driving, hoeing is practically eliminated. The zig-zag cultivation may be carried out in the direction of the rows of trees and crosswise, but the angular turns are so sharp that they do not allow of freedom in driving. Trees planted 24 feet apart on the square give a distance of 34 feet on the diagonal, and if the cultivations are carried out in the direction of the diagonals, the greater distance between trees affords more freedom for driving the horses. By using the zig-zag method, that is by driving the horses from one side of the diagonal row to the opposite side immediately after they have passed the tree, the cultivator can be drawn as close to the tree as the driver desires and no ground need be left unstirred; indeed, care has to be taken not to allow the horses to cut in too quickly lest damage be done by the cultivator cutting the trees. When an extended springtooth cultivator is used there is little risk of damage if the necessary care be taken in driving. On those sides of the trees on which the cultivator is travelling a small triangle of ground is not stirred, but if the succeeding cultivation is done diagonally crosswise to the preceding one, every square inch of ground is cultivated.—W. M. Walker, Orchardist, Glen Innes Experiment Farm.

Poultry Notes.

JANUARY.

E. HADLINGTON, Poultry Expert.

THE most important point this month is to see that the young stock are given the best conditions possible to keep them growing, and thereby increase their resistance to the ailments which are common at this period of the year among badly managed flocks. The main essential is to prevent any crowding, particularly among the later chickens, but the mistake should not be made of thinking that the early pullets can be housed in large numbers with impunity. This error leads to much trouble, which is not fully realised. For instance, such conditions often result in the early moulting of pullets and consequent loss of production. Again, an early outbreak of chicken-pox is frequently the outcome of unduly crowding the young stock.

On farms where the accommodation does not permit of spreading out the growing stock, the best course would be to reduce the second-year hens as much as possible by marketing those which appear unlikely to continue laying through the slack season, or to erect some cheap temporary shelter and run to accommodate them, thus making other pens available for the new season's birds.

Eliminate the Unthrifty Chickens.

Another course open to those who have large numbers of late chickens which are not making the progress they should is to market some of the most backward pullets to make room for the earlier ones. Poultry farmers who finished hatching operations in September should not have a large number of unthrifty birds, but there are some who for various reasons did not hatch their full requirements prior to the date mentioned, and then tried to make up later. In such cases a review of the position with regard to the young stock should convey an object lesson, and the practice is not likely to be repeated, especially when it is realised that these late chickens, unless reared under specially good conditions, will practically cease growing during the two hottest months of the summer.

It is surprising that so many people in country districts leave the ordering of day-old chickens until after September. Chickens obtained late in October or afterwards may grow reasonably well for the first two months, but after that they meet with the hottest weather of the summer and remain almost at a standstill until the weather becomes cooler. The result is that the pullets are two or three months longer coming on to lay than those hatched, say, up to September. Of course, there are exceptional cases where the very late chickens do reasonably well, but it is mostly where they have had perhaps new ground to run on and favourable conditions generally. Under commercial poultry farming conditions, hatching chickens after September only leads to degeneracy, because the same development as in

the earlier chickens is not obtained, and while there are isolated cases where these late chickens have turned out satisfactorily in a favourable season, such fluke experiences do not justify the practice. Maximum development must be aimed at all the time if the physique essential for the production of good-sized eggs is to be maintained.

Autumn Hatching.

Some poultry farmers are making a practice of hatching a large proportion of the chickens for their own requirements between March and May, and then bringing out the balance later in the season. This leaves the mid-season hatchings available for sale as day-olds, but while the purchasers have the benefit of chickens hatched at the best time of the year, those who sell them are storing up trouble for themselves, because it is necessary to use these very early hatched birds as breeders the following year to get early chickens, and the same development is not secured as in the proper season stock, so that a little is lost in physique each year. Moreover, the fact that the chickens are being run over the same ground for a longer period militates against successful rearing.

Another factor is that to hatch sufficient chickens at that time of the year a larger number of breeding birds are required, as egg production is much lower and the same selection cannot be made for quality, which again means retrogression.

If out-of-season hatching is indulged in at all, it is the best policy to confine operations to the months of January to March. This allows a spell between the main hatching season and the late summer operations, and also between this and the next hatchings, but if a regular practice is made of late summer, or autumn, hatching, the only safe course is to have duplicate rearing equipment so that the accommodation does not become fouled by constantly running chickens over the same ground. It then becomes a question as to whether the cost is justified by the results obtained from such birds. Apart from the good prices obtainable for the cockerels if marketed at the right stage, there is no advantage in autumn hatching as a general practice, and from the points of view of egg production and development there is a distinct disadvantage compared with the proper season birds.

Under certain circumstances, such as where sufficient chickens could not be hatched in the main rearing season, or in the case of a person taking up a farm too late to hatch at the right time, it would be an advantage to put through a batch of chickens in the early part of the year rather than mark time for half the year without any returns coming in. Outside of these considerations autumn hatching should not be undertaken except under the conditions stated previously.

Care of the Layers.

As the summer advances a gradual falling off in egg production is expected, but it is perhaps not generally recognised just what an important part good management plays in prolonging the period before the birds go

into a moult. This is where the skill of the poultry farmer is put to the test, as it is the finer points of management that make the difference between continued production and an early moult.

Correct feeding is one of the chief factors which influence production, and what is meant by this is not only the class of feed given, but also the manner in which it is fed to the birds. It is not here proposed to go into the question of the class of foods, as this is dealt with in a leaflet entitled, "Rearing and Feeding Poultry," which is available from the Department, but rather into the method of giving the feed. The manner of feeding calls for much closer attention at this time of the year than it is often given, and a little extra time spent on this work would be amply repaid.

How often does one see the feed hurriedly thrown to the birds, as if feeding were a task to be got through as quickly as possible. The skilful feeder does not rush operations. He puts down a certain quantity of food, and then stands by for a few moments to gauge the appetites of the birds, and, if necessary, gives more food, but if they lack keenness no more is allowed; or the feed is given all round and then he returns to see if more is required. This applies to both morning and evening feeding where the wet mash system is adopted, the art of feeding being to give just as much as the birds will eat at each feeding time without having any food lying about. In some instances where dry mash is used, a partial feed of wet mash is given during the day, and in such cases care is necessary not to feed too heavily with the wet mash, because this will result in the birds becoming surfeited and thus bring about an unhealthy condition.

Feeding during Hot Spells.

When the temperature runs up near to and over a hundred degrees for a couple of days or more it will be found that the birds do not require as much food, and unless the supply is reduced it will take them much longer to get over the effects of the hot spell. It is a good plan after one hot day, if on the next morning it appears likely to continue hot, to reduce the amount of food usually given and also the evening feed, and continue similarly as long as the heat wave lasts. Where the dry mash system is in use, it would be best to close up the hoppers for part of the day as well as reduce the evening feed. By adopting this practice less trouble will be experienced with birds being overcome by the heat, and the egg production is not likely to suffer to the same extent as if the usual feed is given.

Housing.

The question of housing also plays an important part in keeping the hens laying. It is essential that the houses be roomy and well ventilated. Low-roofed houses are always hot in the summer time and cause the birds to swelter, whereas a high roof with a good aperture for ventilation along the back keeps a house much cooler on a hot day. But it is not only the daytime that has to be considered; as a matter of fact, where housing conditions are not good, or the birds are overcrowded in the houses, far more

harm is done at night. For this reason an occasional inspection of the houses should be made during the hot nights to see how the birds are faring. In houses where there are too many birds for the roosting accommodation, or where the perches are too close together, it will be seen that the birds are sweltering, and the atmosphere in the house is almost suffocating. These are the conditions which cause a falling off in egg production, and also bring about an early moult, which means loss of revenue. In the case of young stock, an outbreak of roup may follow, or, at any rate, a complete break up into a moult.

The distance apart of the perches is a very important consideration in housing, also the perching accommodation for a given number of birds. In connection with the distance apart of perches, it should be made a strict rule that at least 20 inches be allowed between them, and, in the hot weather, preferably 2 feet. As a guide to the length of perches required it is a safe practice to allow 7 inches to each bird for the light breeds, which works out at approximately 30 feet for each fifty birds. In the heavy breeds a little more space is desirable.

Heat Waves.

Each summer, when excessive temperatures are experienced, large numbers of birds are lost through being overcome by the heat. Many of these losses could be avoided by the observance of a few simple rules during heat waves. Assuming that the housing conditions are satisfactory as described in the foregoing matter, one of the first considerations is the feeding. Only very light feeds should be given, and there must be no shortage of drinking water, which should be placed in the shade convenient to the houses, or for that matter in the houses, so that the birds do not have to go out into the heat to have a drink. Then when the temperature rises to over 100 degrees in the shade, a constant round of all the pens should be made to see that the birds are not being overcome. The first signs of trouble will be that affected birds will not move when disturbed and will appear prostrated. If they are taken out at once and held under a tap and the heads and underneath the wings well wetted, and if they are then placed in a shady place which has been previously well watered, they will in most cases recover, though several wettings may be necessary before recovery is complete.

On no account should water be thrown in the houses, because this only increases the humidity and accentuates the trouble. There is no objection to wetting the ground in the shade of the trees, but where good airy houses are provided it will be found that the birds will mostly keep in the houses in preference to the shade.

Chicken-pox Season.

Chicken-pox may make its appearance any time from now onwards to April in the coastal districts, but usually it is more prevalent a couple of months hence. Being a blood disease, preventive measures to be effective

must be commenced some weeks before its appearance is expected. Particulars of protective measures have frequently been given in these notes, and when the advice tendered has been carried out strictly to the letter, very little trouble has been experienced with the disease. There are cases where the effectiveness of the treatment has been questioned because some birds have contracted the disease, but in such cases it should be realised that had no precautions been taken the whole flock might have been badly affected. Some instances, too, have come under notice where the protective measures are said to have been carried out properly and not proved effective, but upon investigation it has been found that the correct procedure had not been followed. The protective medicines and the method of administration are given hereunder:—

An ounce of flowers of sulphur for the equivalent of every fifty adult birds should be given in the morning mash every third day for a period of three weeks. Then this should be stopped, and for the next three weeks

A Typical Case of Chicken-pox.

Epsom salts should be added every third day to the drinking water at the rate of 1 oz. to the gallon. At the end of the three weeks stop the Epsom salts and return to the flowers of sulphur in the mash, and continue alternating the treatment until the period during which chicken pox is seasonable is past.

It is emphasised that the full protective benefit of the flowers of sulphur will not be obtained unless the advice given is carried out in its entirety, but in order that no misunderstanding may arise it may be stated in terms of weight for weight. To every 7 or 8 lb. of the mash, whether wet or dry, 1 oz. of sulphur should be mixed, commencing well ahead of the time when the disease is liable to appear and continuing till the season is over—which means that it is advisable to commence the sulphur treatment in this State in the first week in January, and to continue it in alternation with the Epsom salts until about April.

In using dry mash the sulphur should only be given every third day, the same as for the wet mash, or in cases where a partial feed of wet mash is given in conjunction with dry mash feeding, the sulphur could be given in the wet mash.

Vaccination for Chicken-pox.

The question of vaccination as a means of combating chicken-pox is being considered, but although in America vaccine has been used for a few years there are some factors which, to a certain extent, minimise its value. It is stated that it has not been possible to perfect a vaccine which will always produce immunity, though serious losses are usually prevented. The resistance is slow in developing, the period varying from three to six weeks. One vaccination is said to be sufficient in healthy or slightly infected flocks, but in bad cases two are necessary, and in very severe attacks injections may be necessary every five to seven days. It is not advised that the vaccine be used until the disease has made its appearance, and as the vaccine deteriorates rapidly it has to be used at once. It will be seen, therefore, that there are difficulties in the way of the general adoption of this method of combating chicken-pox. However, further research may overcome some of the drawbacks and provide a vaccine without the present apparent limitations.

Use of Paper Mulch in Crop Production.

Paper of the type used as a mulch in pineapple production in Hawaii has been found to be applicable also to a wide variety of crop plants in the eastern United States, according to Dr. L. H. Flint, physiologist, U.S.A. Department of Agriculture, who has recently completed four years' study of the possibilities of paper mulch and its effect on plant growth. An account of Dr. Flint's investigations has been published by the United States Department of Agriculture, at Washington, as Technical Bulletin 75, a summary of the main points in which are given hereunder.

Increased yield and growth have been secured by the use of impervious paper mulch with such common garden crops as corn, beets, carrots, green beans, squashes, and others. In many instances the yield was from one and a half to three times as great as from unmulched crops.

On the basis of the plot tests thus far made, the use of paper mulch, says Dr. Flint, in addition to increasing yields, eliminates all weeding between rows, facilitates weeding between plants in the row, and does away with the necessity for cultivation. In certain crops further advantages reported are increased germination which results in greater yields, a marked hastening of maturity and a superior crop product in point of size, quality and cleanliness. The increases obtained appeared normal in every way, there being no indication of a tendency towards excessive vegetative vigour.

The type of paper used in these trials—the heavy, asphalt-saturated and coated thermogen—was especially designed to withstand the weathering of the three to five years' duration of the pineapple plantation. It seems possible, says Dr. Flint, that a less durable paper may be cheaper and as satisfactory over a short priod. The extent to which paper mulch will find a place in gardening and agriculture can be determined, he says, only through wide individual experimentations.

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Agricultural Gazette of New South Wales.

Championship Field Wheat Competitions.

THE JUDGES' REPORTS.

Riverina Wheat Area.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.

TWELVE district societies in the Riverina organised field wheat competitions, the winner in each case being eligible to compete for the championship conducted by the Royal Agricultural Society. Despite the very adverse season experienced in the far-western portions of this division, which caused three societies to refrain from holding a competition this year, it is gratifying that the number of local competitions conducted was no less than in any previous year. An initial effort was made at Deniliquin, but, unfortunately, the winning crop was harvested before the visit of the Royal Agricultural Society's judge.

The societies whose entries were judged for the championship were Albury, Berrigan, Coolamon, Corowa, Culcairn, Henty, Lockhart, Murrumbidgee (Wagga), Narrandera, Oaklands (Farmers and Settlers' Association), and The Rock (Farmers and Settlers' Association).

Owing to the early ripening of the crops, it was necessary to commence judging on 20th November, about ten days earlier than is usual, and it was completed on 24th November.

The Season.

Good rains during the first three months of the year ensured that the fallows were well charged with moisture when the sowing period arrived, and coupled with ideal weather for seeding operations, there resulted a good germination and excellent early growth. The winter rains were much below average, and were made up of very light falls of little service, but in spite of this the condition of the crops up to August gave rise to anticipations of record yields. Dry conditions unfortunately persisted throughout August and September which, accompanied by temperatures above normal, and frequent high winds, had a depreciating effect on the wheat crops and hastened maturity. The climax arrived in the form of a cyclone on the 7th October, which materially damaged the advanced crops in far western districts. Subsequent cooler conditions and light showers during October were of considerable benefit, and saved the situation in the more eastern districts and a satisfactory harvest resulted.

The Leading Crops.

The names and particulars of prize-winners are as follows :—

E. Eldershaw, Kywong, Marrar (Coolamon Society)	1
C. W. Moll, Elderslie, Gerogery (Albury Society)...	2
J. W. Gooden, junr., Willowlee, Boree Creek (Lockhart Society) ...	3

Details of the awards and of the cultural methods of each competitor's crop are shown in the accompanying table.

The crop which won the championship consisted of 37 acres of Yandilla King and 13 acres of Free Gallipoli, and was produced on red loam derived from granite. Both crops were dense and not over-tall, and were estimated to yield an average of 34 bushels. While the crop of Yandilla King was well up to pure seed standard, the purity of the Gallipoli was marred by the presence of some strangers. The only disease was flag smut, of which there was an appreciably greater infection in the Gallipoli than in the Yandilla King, which is not very susceptible to the disease. The crop was fairly free from weed growth, there being only a few wild oats and wild poppies.

The second-prize crop comprised 30 acres of Yandilla King and 20 acres of Bena grown in a friable red loam. The crops of both varieties were well headed and fairly dense, and the estimated average yield of 38 bushels was the highest in the competition. The Yandilla King was judged to be the higher yielder, and it scored better in most other respects. While the purity of the Yandilla King was satisfactory, the Bena contained many strangers, and the type was at fault. There was also a much greater infection of flag smut and weed growth was more prevalent, consisting of wild oats, charlock, cockspur, sorrel and undergrowth. Several take-all patches and a little foot rot were present, and a slight infection of bunt was detected in the Yandilla King crop, which disease the bluestone treatment had not been successful in effectively controlling.

The crop which was awarded the third prize was also of the Yandilla King variety, produced on a light red loam under drier conditions than the other leading crops. Had a little more rain been experienced in the early spring, a much better yield would have resulted, and it would have been a difficult crop to beat, for it scored very well under all other headings. It was remarkably free from disease and weed growth, and was also of a high standard of purity.

Lessons from the Competition.

Cultural Methods.—The value of conserving moisture by means of fallowing methods has again been emphasised. The preparation of the fallow months before sowing made it possible for the heavy rains which fell during the late summer to be collected and stored in the soil for the needs of the subsequent crop. It was this reserve of soil moisture that enabled the crops to hold out against the adverse conditions that were experienced during the winter and early spring.

The importance of ploughing the fallow early was well recognised, and, in spite of the dry conditions which were ruling during the winter of 1927, most of the competitors were successful in ploughing their fallows in June and July. It is interesting to note that the first cultivation of the fallow

which produced the winning crop was made in August, and the crops placed second and third were cultivated in September, while the majority of the other fallows were not cultivated until October and November. The value of performing the initial cultivation of the fallow early in the spring cannot be over-emphasised, for this is the period during which there is the greatest loss of soil moisture, unless evaporation is checked, and any delay in creating a soil mulch is at the expense of the soil moisture. Furthermore, while it is a benefit to leave the soil in a rough state during the winter months in order that it may be in a more receptive condition to absorb the winter rains and to expose as great a surface as possible to weathering influences, still it is a disadvantage when evaporation agencies arrive in the early spring; consequently the exposed surface of soil should then be reduced to a minimum as soon as possible. For this purpose the wide stretches of heavy stump jump harrows are invaluable, for the mulch can be created in a minimum of time.

Varieties.—This year's competition constitutes a veritable triumph for the Yandilla King variety. Not only is it represented in the three winning crops (and in each of the composite crops it was the better of the two varieties), but it also occurred in six out of the eight most successful entries. This variety prefers soils that are inclined to be heavy, and responds well to good treatment. When sown reasonably early on a well-worked fallow it is not too bold an assertion to claim that there is no better variety in general cultivation. The ears are liable to be " tipped " if insufficient provision is made for conserving soil moisture or when sown late, and under such conditions is frequently disappointing. Moreover, on light soils, Penny is invariably more successful. Marshall's No. 3 is a strong rival to Yandilla King in the more favoured districts, where it usually returned a slightly better yield, but it does not possess as strong straw, hold its grain as well, nor is it as disease resistant.

Waratah was not as successful as in 1926, and for the same reason as last year, namely, that crops of this variety were too far advanced to receive as much benefit from the October rains as did varieties of later maturity. Free Gallipoli made its first appearance in championship competitions, being the winning crop at Oaklands, and forming a small portion of the Coolamon crop which won the championship. There was a variation of type in both crops, conveying the impression that the variety was not properly fixed. The original Gallipoli exhibited considerable variation of type, and was very tough to strip. The more recent strain strips much more freely and therefore has been designated Free Gallipoli. It is a variety of the Federation type with short straw and brown ear, and is well suited to Riverina conditions. More will probably be seen of it in future competitions.

Seeding Operations.—The period of sowing of the competing crops was from 8th April to 18th May. It was a season which favoured early-sown crops. When early autumn rains are experienced, it is invariably good

DETAILS of Awards—Riverina Wheat Area.

Name and Address of Competitor.	Local Society	Variety.	Methods of Cultivation.	When Sown.	Quantity of Seed per Acre.	Quantity of Superphosphate per acre.	Number of Crops grown previously.	Rainfall during effective period, April to October.	Points Awarded. Apparent Yield. (One point for every bushel.)	Trueness to Type. Maximum, 20 points.	Freedom from Disease. Maximum, 30 points.	Evenness. Maximum, 20 points.	Condition. Maximum, 10 points.	*Cleanliness. Max., 30 points.	Total Points.
E. Eldershaw, Kywong, Marrar.	Coolamon ...	Yandilla King, 37 acres; Free Gallipoli 13 acres.	Fallowed 5 inches deep in June; harrowed and cross-harrowed in August: springtoothed deep end of October; scarified in November, again January, and again February; harrowed after sowing.	12th to 15th April.	lb. 65	lb. 75	Old land.	ins. 10.44	34	18	28½	19	10	28	137½
C. W. Moll, Elderslie, Gerogery.	Albury ...	Yandilla King, 30 acres: Bena, 20 acres.	Fallowed July-August 4 inches, harrowed September; scarified October, again in January, and again in March and in May.	Second week May.	75	90	,,	13.37†	38	17	25½	19	9	27	135½
J. W. Gooden, junr., Willowlee, Boree Creek.	Lockhart ...	Yandilla King ...	Fallowed 4½ inches deep in June; springtoothed September full depth; harrowed January; scarified March.	20th April	75	85	,,	8.75†	30	19½	29	19	9	28½	135
E. R. Schulz, Fairview, Culcairn.	Culcairn ...	Waratah ...	Fallowed in July 4½ inches; springtoothed October, again March; scarified in April.	Third week April.	80	85	,,	10.65†	32	18	28	19	9	28	134
W. and O. Field and E. Carroll, Ltd., Collendina, Corowa.	Corowa ...	Marshall's No. 3	Fallowed in August 4½ inches deep; harrowed September; springtoothed October; disced in March; springtoothed in April. Crop fed off early in July.	End of April.	60	80	,,	10.24†	35	18	28	18½	9	25	133½

W. A. Zweck and Wheaton Bros., Munyabla Park, Henty.	Henty ...	Yandilla King ...	Fallowed July 4 inches deep, harrowed September; part springtoothed and part scarified end of October, and again in March.	End of April.	70	70	"	9.17	35	15	28	17½	10	27
Boxsell Bros., Woodfield, Marinna.	Wagga ...	Yandilla King ...	Harrowed March, 1927; ploughed early August 3½ inches deep; springtoothed end of October full depth; springtoothed February with broad tines. Crop fed off late in June.	10th April	70	80	"	11 39	31	19	26	19	10	25
H. M. Gooden, Glen Oak, Narrandera.	Narrandera	Yandilla King ...	Fallowed October 4 inches deep; springtoothed November, again in March and again before sowing.	Mid April	60	60	5	8.59†	27	18½	29	19	8½	27½ (29)
J. H. Kingston, Maryvale, Coreen.	Oaklands F. and S. Association.	Free Gallipoli ..	Fallowed in July 4½ inches deep; harrowed August; springtoothed October, and again March. Crop fed off early July.	18th May	71	93	Old land.	..	28	18	27	20	10	26
G. S. Magrath, Clifton, The Rock.	The Rock F. and S. Association.	Waratah ...	Fallowed June 4½ inches deep; cross-harrowed October; cross-scarified November; cross-scarified March.	Mid April	90	112	Over 6	9.94†	31	19½	24	18	6	24
Ednie Bros., Wanborough, Berrigan.	Berrigan ...	Penny	Fallowed September 3 inches deep; springtoothed January, again early March and again end March. Crop fed off early July.	8–9th April.	60	60	Old land.	7 08†	25	17	27	18	9	26

* First crop, 24 points; second, 25; third, 26; fourth, 27; fifth, 28; sixth, 29; over six crops, 30 points. In parentheses is shown the maximim if below 30.

† Rainfall registration at a near post office.

practice to sow early, for the reason that the very wet soil rapidly becomes cold, with the result that late sown crops germinate very slowly and do not stool well, and, moreover, little growth is made during the winter. Under favourable autumn conditions such early-sown crops make a very rapid and prolific early growth which requires checking by grazing with sheep. This is a practice, however, which requires the exercise of a certain amount of judgment; the crop should not be permitted to become too far advanced before feeding off, which should be performed as rapidly as possible by stocking heavily with sheep, and the crop should not be fed off too late in the season, for safety not later than the middle of July, for if dry conditions should supervene there would be a risk that the crop would not recover satisfactorily. It is also very important that the land should be reasonably free from weed growth, otherwise the feeding off will allow the weeds to dominate at the expense of the crop. Four of the crops in the competition were fed off in late June or early July, apparently without suffering any material depreciation.

The rate of seeding varied from 60 to 90 lb., with an average of 70½ lb. per acre. The two crops of Waratah were sown at the rate of 80 lb. and 90 lb. per acre, and while there may be some justification for such high quantities of seed of this poor stooling variety when a late sowing is made in June, still the rate is excessive for an April sowing. The crop sown at the rate of 90 lb. was badly infected with flag smut, and was therefore not over dense, but many very dense crops resulting from heavy seedings finished off very badly, and it is time that a halt was called in regard to increasing the seeding rates. An average rate of a bushel per acre is invariably ample for early-sown crops, but the quantity requires to be increased as the sowing period advances, or if the variety is of poor stooling capacity.

The application of superphosphate varied from 60 to 112 lb. per acre, with an average of 81 lb., which is 10 lb. per acre less than in the preceding year's competition.

Diseases.—The dry copper carbonate treatment was used for the prevention of bunt by all but two competitors, one of whom used formalin and the other bluestone. The only crop in which an infection of bunt was detected was that produced from the bluestone-treated seed, which served to demonstrate that bluestone treatment is not as effective in controlling bunt as the copper-carbonate method.

By reason of the compactness of the seed bed by the autumn, it was anticipated that flag smut infection would be at a minimum. All the crops of Yandilla King, excepting one, were fairly free from flag smut, but one crop of Waratah had a greater infection than any competition crop previously judged, and Bena also was fairly badly infected. Take-all was in evidence in one crop in particular, apparently due to ploughing the soil when in a dry condition.

MIDDLE WEST WHEAT AREA.

E. S. CLAYTON, H.D.A., Senior Experimentalist.

Fourteen crops qualified to enter for the Royal Agricultural Society's Cup for the champion wheat crop of 50 acres in the middle western district. Unfortunately, the Gilgandra crop ripened so early in the season that it had to be stripped before it could be judged. The following societies entered their best crop for championship honours: Narromine, Dubbo, Parkes, Forbes, Bogan Gate, Wellington, Cumnock, Eugowra, Tullamore, Molong, Condobolin, and Trundle.

The Season.

The weather experienced in the autumn was quite satisfactory, but, unfortunately, grasshoppers were troublesome at some centres, and early crops were eaten off in some cases, while in others sowing was delayed until the menace passed. The winter rain, although light, was satisfactory at most centres. It was very scanty at Condobolin, however. The months of August, September, and October were very dry, and it is remarkable that such good crops were produced in spite of the dry spring.

At Condobolin, Mr. Dunn produced a crop of 35 bushels, which only received 3 inches of rain during the growing period. It is necessary to explain that most of the land on which this crop was grown was inundated by flood rains in the autumn. Consequently, the subsoil was saturated during January and February. Exceptionally heavy rains (6 to 8 inches) were received, and some of the soils right throughout the wheat belt were inundated. In any case, those that were not actually under water received these heavy falls in the autumn, and consequently were saturated with moisture. Where good farming methods were of assistance was in the conserving of this moisture in the fallow, and those farmers who scientifically worked their fallows after these heavy autumn rains conserved the moisture and subsequently grew the best crops. Considering the dry spring, it was extraordinary how well the crops withstood the conditions, and gave such good returns, but it is all explained by the conservation of those autumn rains. Had we not received them, the exceptionally dry spring would have played havoc with the crops, and yields would have been low right throughout the State.

This explanation of the satisfactory yields obtained this year in the dry districts is worth emphasising, as it illustrates how necessary it is for the successful wheat grower to be ready with his cultural implements to take advantage of any heavy rains that fall, so that he can conserve them and see to it that his fallows enter the winter season with as great a reserve of moisture as possible. It is the man who has not cultivated his fallow who suffers in the dry weather, whereas on the well-worked fallows everyone is agreeably surprised to see how well the crops hang on in a dry spring. This

season furnishes an excellent lesson on the necessity for effective conservation of the moisture that falls on the fallow, no matter at what time of the year it is received.

RAINFALL for the Growing Period.

Competitor.	Society.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Total.
		Points.	Points.	Points.	Points.	Points.	Points.	Points.	Points.
E. Jones ...	Narromine...	...	37	103	234	30	12	53	469
W. H. and C. E. Godwin.	Dubbo ...	114	28	116	163	3	16	46	486
A. P. Unger ...	Parkes ...	...	70	211	260	86	34	67	728
W. McKay ...	Tullamore...	170	28	179	216	36	7	75	711
T. M. Dunn ...	Condobolin	86	43	30	73	0	3	71	306
Sherritt Bros. ...	Forbes ...	255	47	191	256	62	47	128	986
S. Murray ...	Manildra ...	165	79	171	237	77	61	188	978
G. E. Bradley and Son.	Molong ...	160	61	126	230	35	27	152	791

The Leading Crops.

The prize winners were :—

A. P. Unger, Stony Hill, Alectown (Parkes Society) 1
E. J. Mill, Durran, Gunningbland (Bogan Gate Society) 2
P. H. Whiteley, Wooloo, Ponto (Wellington Society) 3

Mr. Unger gained first place with a very heavy crop of Waratah. The land had been ploughed in the winter to a depth of 4 to 4½ inches. It was harrowed in August, springtoothed to the full depth in September, harrowed in October, springtoothed in November, scarified in December, harrowed in January, scarified in February, springtoothed and harrowed in March, and scarified in April. It was sown on the 7th May with 60 lb. of seed and 60 lb. superphosphate per acre. The land was heavy black to brown self-mulching clay loam, and in the ploughing skeleton mouldboards were used. On such country the skeleton mouldboard gives much better results than does the ordinary implement. The crop was true to type, and well up to pure seed standard, even and clean, and was estimated to yield 40 bushels to the acre.

Mr. Mill's crop of Sultan gained second place. The fallow had been well cultivated (eleven times in all), and the workings were shallow. It was sown on 15th May, with 60 lb. of seed and 109 lb. of superphosphate to the acre. It was an exceptionally good crop in every respect, and was estimated to yield 35 bushels to the acre.

Mr. Whiteley's crop of Turvey came third. It was grown on medium yellow loam, which originally carried yellow and white box. The land had been ploughed in August to a depth of 4 inches, harrowed in October, scarified 3 inches deep in December, springtoothed 2 inches deep in February, harrowed in March, and sown on 4th April with a combine; 60 lb. of seed and 45 lb. of superphosphate to the acre being used. It was estimated to yield 35 bushels to the acre.

Cultivation Methods.

All the competitors adopted sound cultural methods, which enabled their crops to yield well in spite of the dry spring. The heavier soils seemed to stand out to advantage this season. More attention is being paid in recent years to evolving methods of cultivation to suit these soils, and they are responding admirably to the more intelligent treatment. Such soils are not being ploughed as deeply as formerly, and are being cultivated with a rigid tine scarifier. The heavy soils must have their subsoils saturated, either in the fallowing or growing period, in order to produce heavy yields in a dry year. Given this, it is remarkable how much dry weather they can withstand.

It is pleasing to note how much attention wheat growers are now paying to the compaction of the seed bed. Rain is required to bring about this compaction of the sub-surface soil, and in the drier districts if the land is ploughed too deeply, sufficient rain is not received to thoroughly pack the seed bed and it is left too loose and open. This causes the crops to grow more slowly in the early stages and appears to render them more liable to attack by take-all and flag smut.

Comments.

All the crops entered in this championship were grown from seed that had been treated with copper carbonate, and very satisfactory results were obtained. Traces of flag smut were noticeable in most of the crops, but the disease was not so prevalent this year as in some former years. On most of the crops 60 lb. of seed to the acre had been used, but at Forbes and Manildra 70 lb. and 80 lb., respectively, were sown. As a rule ½ cwt. of superphosphate to the acre was used, but at Bogan Gate on Mr. Mill's crop 109 lb. was applied with excellent results.

Waratah was well represented in the competition, being by far the most popular variety this year. The season, of course, suited Waratah, but the fact that it yielded so well on soils that varied from light red loam to heavy brown self-mulching clays demonstrates its exceptional soil adaptability and its outstanding merit as a heavy yielder.

The prevalence of flag smut has caused farmers grave concern in recent years, and as Nabawa has shown itself to be resistant to the disease, it is being widely tried by wheat growers. Messrs. Sherritt Bros. of Forbes entered an excellent crop of 30 acres of Nabawa and 20 acres of Waratah. The Nabawa was quite free from flag smut, while the Waratah showed the disease. It is also pleasing to note that this variety promised to yield even better than the Waratah, although both varieties were sown under exactly the same conditions and were situated side by side. Nabawa has widely demonstrated its resistance to flag smut, and if it also proves capable of yielding well over a wide range of soils and climates, it will be of great assistance in controlling the disease in this State.

DETAILS of Awards—Middle-West Wheat Area.

Name and Address of Competitor.	Local Society.	Variety.	Methods of Cultivation.	When Sown.	Quantity of Seed per acre.	Quantity of Superphosphate per acre.	Number of Crops grown previously.	Rainfall during effective period, April to October.	Points awarded. Apparent Yield. (One point for every bushel.)	Trueness to Type. (Maximum, 20 points.)	Freedom from Disease. (Maximum, 30 points.)	Evenness. (Maximum, 20 points.)	Condition. (Maximum, 10 points.)	*Cleanliness. (Maximum, 30 points.)	Total Points.
A. P. Unger, Stony Hill, Alectown.	Parkes	Waratah ...	Ploughed 4 to 4½ inches deep in winter; harrowed August; springtoothed to full depth September; harrowed October; springtoothed November; scarified December; harrowed January; scarified February; springtoothed and harrowed March, scarified April.	7th May	lb. 60	lb. 60	Old land.	ins. 6·58	40	19	28	19	8	29	143
E. J. Mill, Durran, Gunningbland.	Bogan Gate	Sultan	Sundercut 2½ inches deep in June, then worked eleven times with springtooth cultivator and harrows.	15th May	60	109	20	...	35	18	28	19	9	29½	138½
P. H. Whiteley, Wooloo, Ponto.	Wellington	Turvey	Ploughed August 4 inches deep; harrowed October; scarified December 3 inches, springtoothed February 2 inches; harrowed March. Sown with combine.	4th April	60	45	Old land.	...	35	19	29	19	8	27	137
Sherritt Bros., Back Wallawalla, Forbes.	Forbes ...	Waratah and Nabawa.	Ploughed August 3½ inches deep; springtoothed October (deep); disced February; springtoothed March and again May.	9th May	70	70	3rd crop.	9·86	39	18	28½	19	8	24	136½
W. Rutter, Hillview, Burimbla.	Cumnock ...	Yandilla King ...	Ploughed August 4 inches deep; springtoothed September 2 inches deep. Stocked heavily. Sown with combine.	30th March.	66	31	Old land.	...	33	18	29	18	8	29	135

B. Jones, Iona, Narromine.	Narromine	Waratah ...	Ploughed August; springtoothed October; harrowed November; disced January; springtoothed February; disced April.	16th May	60	50	,,	4·69	31	19	27	19	8	29	133
W. H. & C. E. Godwin, Alton Park, Mogriguy.	Dubbo ...	Hard Federation	Fallowed 1926. Crop failed and was fed off. Springtoothed November; harrowed January, and again February.	20th April	50	50	,,	4·86	32	18	28	18	7	29	132
C. O'Neil and Bowen, Yarrangah, Murga.	Eugowra ...	Waratah and Bena.	Ploughed September; disced February. Heavily stocked. Sown with combine.	5th May	55	65	,,	...	36	17½	27	16	8	25	129½
W. McKay, New Park, Tullamore.	Tullamore...	Waratah ...	Sundercut January 1927; springtoothed twice in November; harrowed and scarified December and February; harrowed March. Sown with combine.	22nd April.	60	90	,,	7·11	30	16½	28½	18	9	27½	129½
G. E. Bradley and Son, Kyton Park, Pinecliff.	Molong ...	Turvey	Ploughed 4 inches deep in June; disced November 3 inches deep; springtoothed twice prior to sowing. Sown with combine.	12th April.	60	70	,,	8·69	28	18	28	18	8½	29	129½
S. Murray, Green Grove, Manildra.	Manildra ...	Waratah ...	Ploughed 4 inches deep in August; springtoothed October over 3 inches deep; disced January and again March; springtoothed April.	30th April.	80	80	,,	9·78	34	17	28	18	8	24	129
T. M. Dunn, Kurrawonga, Condobolin.	Condobolin	Federation ...	Previous crop failed and was fed off. Springtoothed January 2½ to 3 inches deep, and again in February. Sown with combine.	15th April.	45	44	5th crop.	3·06	35	10	26	17	9	24	121
K. Gault, Lynwood, Trundle.	Trundle ...	Waratah ...	Ploughed June 3½ to 4 inches deep; harrowed October; springtoothed November; harrowed January; springtoothed March. Sown with combine.	5th May.	60	60	Old land.	4·10	25	17	25	17½	9	26	119½

* First crop, 24 points; second, 25; third, 26; fourth, 27; fifth, 28; sixth, 29; over six crops, 30 points.

North-North-west Wheat Area.

G. C. SPARKS, H.D.A., Manager, Glen Innes Experiment Farm.

The North-North-West Field Wheat Championship, conducted by the Royal Agricultural Society in 1928, resulted as follows :—

Messrs T. and D. Scott, Aberfeldie, Currabubula (Quirindi Society) ...	1
A. H. McGowan, Rotherwood, Tangaratta (Tamworth Society) ...	2
Messrs. Waddell Bros., Glengowrie, Oakwood (Inverell Society) ...	3

Due to the pronounced growth of interest in district competitions, nine crops qualified for championship honours, namely, the winners at Inverell, Moree, Narrabri, Boggabri, Wee Waa, Gunnedah, Coonabarabran, Quirindi and Tamworth; being the most extensive field in my experience and covering almost completely the north-north-west wheat belt.

The Season.

In the April to October rainfall of 1928 there was great variation between centres, the Wee Waa crop receiving 579 points and Quirindi 1,593. Generally, however, the fallow and early winter rains were copious, and although August and September were practically rainless the October precipitation was sufficient to fill the crops on fallowed land. At Wee Waa, however, the season finished dry, which explains the position of this crop in the schedule of awards.

The Winning Crops.

Messrs. T. and D. Scott's crop was an exceptionally fine paddock of Waratah grown on a chocolate loam which has been under cultivation for many years. The land was summer fallowed, mouldboard ploughed in January, harrowed in March, and sown by combine in mid-April with 50 lb. of locally-grown, graded seed without fertiliser. The crop was fed off by sheep between 7th June and 14th July. The apparent yield was 35 bushels per acre. Purity was marked, but slightly off type, probably due to local conditions of growth. The crop was healthy, except for slight traces of flag smut and leaf rust. It was very even, standing well, and weed-free, except for an odd black oat and thistle. It will be noted that this crop was produced on a minimum of cultivation.

Mr. McGowan's entry comprised Waratah and Hard Federation varieties, also grown on an "old" chocolate loam, which was ploughed 4½ inches deep in January with a stump-jump mouldboard, harrowed February, skim-ploughed March, and sown by combine in mid-April with 55 lb. graded seed, no fertiliser. This crop was not grazed, but like the other two placed crops the fallow was heavily stocked. The apparent yield was 32 bushels per acre, purity was marred by a few "strangers," and flag smut was present. The crop was a little uneven and thin in places, due to running water following the heavy fallow rains, but was very free of weeds except for a little cockspur.

The Inverell crop, Cleveland, was also on "old" land, a black chocolate loam, self-mulching and overlying a yellow clay. This crop was on long fallow, the paddock being mouldboard ploughed in August, 1927, and scarified during the November, February, and April following. Seeding was carried out on 18th May with 60 lb. graded seed, no fertiliser. The crop was fed off in July. Estimated yield was 34 bushels per acre. Type was good, but other varieties were present. Flag smut was more severe in this crop than in any other inspected. The crop was somewhat uneven and slightly tipped in places, probably due to soil variation. Weeds were represented by a light sprinkling of black oats and a little Darling pea.

Seed, Varieties, &c.

As regards type and purity, the winning crops were quite good. Over the last few seasons there has been a very marked improvement in this phase of crop production, and those of 1928 averaged better than those of 1927. At the same time, however, still further improvement is possible, and the attention of farmers might be again directed to the advisability of purchasing annually small parcels of seed from the most desirable sources for the purpose of developing supplies of pure seed. Maximum yields are never possible without full attention being devoted to the seed factor.

Six varieties of wheat were included in the crops inspected. Waratah appearing six times, Hard Federation twice, and Cleveland, Riverina, Wandilla, and Canberra each once. Waratah is the most popular wheat of the moment in the north-north-west wheat area, being peculiarly suited to conditions prevailing over that territory, while its continued success in field wheat competitions tends to focus attention upon it.

The seeding rate ranged from 40 lb. per acre at Gunnedah to 60 lb. at Inverell, the common rate being approximately 50 lb. per acre. In every case graded seed was used and no manure.

Diseases.

The most striking feature of these crops as compared with other years, was the prevalence of flag smut, every crop being affected. The Inverell crop which was on long fallow following maize in 1926–27 carried the heaviest infection. In previous seasons the amount of flag smut in the championship crops has been very slight, but it is now obvious that closer attention must be given to it. The importance of fallow in flag smut control has been fully stressed, but consideration might be given in the north-north-west district to the increased use of oats, both for hay production and for grazing, which practice would tend to lessen the possibilities of spreading the disease. The danger of soil infection by the use of flag-smutted wheaten chaff is well known, and therefore an increase in the use of oaten chaff, along with a greater area of oats for grazing and fodder conservation, would be a definite move to combat the spread of the disease.

DETAILS of Awards, North-North-west Wheat Area.

Name and Address of Competitor.	Local Society.	Variety.	Methods of Cultivation.	When Sown.	Quantity of Seed per Acre.	Quantity of Superphosphate per acre.	Number of Crops grown previously.*	Rainfall during effective period, April to October.	Points Awarded. Apparent Yield. (One point for every bushel.)	Trueness to Type, Maximum, 20 points.	Freedom from Disease, Maximum, 30 points.	Evenness, Maximum, 20 points.	Condition, Maximum, 10 points.	*Cleanliness. Max., 30 points.	Total Points.
					lb.			ins.							
T. and D. Scott, Aberfeldie, Currabubula.	Quirindi ...	Waratah ...	Mouldboard ploughed January, 1928; harrowed in March.	Mid-April	50	Nil.	Old land.	15·93	35	19	29	19	9	28½	139½
A. H. McGowan, Rotherwood, Tangaratta.	Tamworth ...	Waratah and Hard Federation.	Ploughed January, 1928 (mouldboard stump-jump); harrowed February; skim-ploughed March	19th to 26th April.	55	,,	,,	9·21	32	19	28½	18½	9	29	136
Waddell Bros., Glengowrie, Oakwood.	Inverell ...	Cleveland ...	Mouldboard ploughed in August, 1927; scarified November, February and April.	18th May	60	,,	,,	10·27	34	18½	27½	18	8½	28	134½
S. Carberry, Cadargo, Culgoora.	Narrabri ...	Waratah ...	Previous crop fed off; springtoothed in November, 1927, ploughed December; springtoothed February.	Mid-April	45	,,	6	...	32	17½	29½	16½	9	29	133½
W. F. White, Pinegrove, Boggabri.	Boggabri ...	Waratah ...	Disc ploughed in January; springtoothed and harrowed in February and April.	20th May	56	,,	Old land.	...	30	18	29	18½	9	28½	133
J. Cavanagh, Springhurst, Curlewis.	Gunnedah ...	Wandilla ...	Disced in December, 1927; springtoothed January, 1928; scarified February and March; harrowed April.	20th April.	40	,,	3	7·76	34	18½	27½	18	9	25	132
W. Sanson, Lockwood, Purlewaugh.	Coonabarabran	Canberra and Riverina.	Mouldboard ploughed January 1928; springtoothed mid-April.	Second week in May.	48	,,	Nil	...	29	18	28	18½	9	23½	126
W. E. Tonkin, Myee, Pallamallawa.	Moree ...	Waratah ...	Disced in December, 1927; harrowed January; scarified February, March and April; sown and harrowed.	2nd May	48	,,	8	9·08	27	19	27	18	9½	25	125½
D. Russell, Lowanna, Wee Waa.	Wee Waa ...	Waratah and Hard Federation.	Disced in January, 1928; springtoothed February; disced March. Grass on surface raked and burnt.	Mid-May	52	,,	4 and 6	5·79	20	19	29	18	9½	26	121½

* First crop, 24 points; second, 25; third, 26; fourth, 27; fifth, 28; sixth, 29; over six crops, 30 points.

Bunt was not found in any of the crops. The use of copper carbonate is now universal, and the most careful inquiries among growers of the champion crops failed to reveal any complaint regarding lack of efficacy of this specific.

Loose smut was present in one crop only, and just now does not claim much attention in this division. Where necessary, the disease is best controlled by the use of seed from clean crops.

Leaf rust and a little stem rust were observed, but in no case to any serious extent. The rusts are mainly seasonal in operation, and can best be combated by timely sowing of resistant wheats.

Weeds.

The usual sprinkling of black oats was in evidence, but on the whole the crops were very weed-free, which is a matter for congratulation in view of the system of summer fallow peculiar to the north-north-west wheat area. Here also a periodical long fallow is essential in the case of continuous wheat cropping. The incidence of the rainfall makes long fallow unnecessary for moisture conservation, but it is essential for controlling black oats. Thistles, cockspur, and Darling pea were present in the crops, but never in appreciable quantities.

Central South-west Wheat Area.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.

NOTHING can be more encouraging to all concerned in the work of conducting the championship field wheat competitions than the splendid response of the societies in the central south-west division, in spite of the vagaries of the season and the ravages of grasshoppers. No less than eighteen district societies organised competitions, which is two in excess of the number of entries in the previous year's competition in this division. Griffith Agricultural Society and Tullibigeal Agricultural Bureau made their first appearance in this inter-district contest, while the weather conditions were so adverse as to preclude the possibility of a successful competition at Hillston.

The societies which submitted entries for the championship were: Ariah Park, Ardlethan, Barellan, Barmedman, Burrowa, Canowindra, Cargelligo, Cootamundra, Cowra, Grenfell, Griffith, Murrumburrah, Quandialla, Temora, Tullibigeal, Ungarie, West Wyalong, and Young. As in previous years, it was necessary to judge the competition in two sections owing to the later maturity of the crops in the more eastern districts, and as the crops generally were ripening at least ten days earlier than normally, the time of judging had to be advanced accordingly, the judging of the earlier section being commenced on 5th November, and completed on 10th November, while the crops in the later districts were judged on 26th and 27th November.

DETAILS of Awards—Central South-west Wheat Area.

Name and Address of Competitor.	Local Society.	Variety.	Methods of Cultivation.	When Sown.	Quantity of Seed per acre.	Quantity of Superphosphate per acre.	Number of Crops grown previously.	Rainfall during effective period, April to October.	Points Awarded. Apparent Yield. (One point for every bushel.)	Trueness to Type. Maximum, 20 points.	Freedom from Disease. Maximum, 30 points.	Evenness. Maximum, 20 points.	Condition. Maximum, 10 points	*Cleanliness. Max., 30 points.	Total Points.
					lb.	lb.		Ins.							
B. J. Stocks and L. Harnett, Linden Hills, Cunningar.	Murrumburrah.	Marshall's No. 3	Fallowed July-August 5½ inches deep; scarified October full depth; scarified February 2¼ inches; scarified before drilling; crop fed off early July.	Mid April	75	80	Old land.	11·64	38	19	28	19	9½	29½	143
F. C. Rowlands and Sons, Werribee, Waugoola.	Cowra ...	Waratah ...	Fallowed September 5 inches deep; harrowed November; springtoothed December; disced January; springtoothed February and again May.	Last week May.	66	85	,,	13·25	42	19	25	19	7	27	139
J. W. Crowley, Victoria Park, Old Junee.	Temora ...	Nabawa ...	Fallowed June with disc cultivator 2¼ inches deep; disced end October 4 to 5 inches deep; springtoothed January and again March.	Last week April.	65	80	5	9·11	36	17½	29	18½	9	27 (29)	137
A. E. Anderson, Almondale, Quandary.	Ariah Park	Federation ...	Fallowed July without mouldboard 5 inches deep; harrowed August; springtoothed October; springtoothed February and March.	First week April.	70	80	Old land.	9·65†	37	16	28	18	9½	27	135½
H. G. M. Thackeray and Sons and Hambrook, Wootoona, Young.	Young ...	Yandilla King ...	Fallowed August 4½ inches deep; harrowed September; scarified end October; harrowed January; scarified January, again March; and again before drilling.	10th May	60	56	,,	11·45	34	18	29	19	9½	26	135½
G. Ceeney and F. E. Bassingthwaighte, Allowrie, Wallendbeen.	Cootamundra	Bena	Fallowed August-September 4 inches deep; harrowed October; springtoothed deep November; disced March; springtoothed late April.	7th May	63	58	,,	10·88+	41	14	29	19	9	23	135
G. Gow, Hughendon, Barellan.	Barellan ...	Waratah ...	Fallowed February, 1927, 4 inches deep; harrowed and scarified early March; scarified twice in April.	Last week April.	60	60	7	6·82	32	19½	28	18	8	29½	135
Maguire and Fehon, Aorangi, Barmedman.	Barmedman	Waratah ...	Scarified February, 1927; ploughed 3 inches deep June-July; springtoothed early Sept.; full depth springtoothed October-November; scarified January; springtoothed Feb., and again March; harrowed April and again May.	8th to 9th June.	80	100	7	6·63	26	19½	28	19½	10	30	133

H. and A. H. Goodacre, Felton, Canowindra.	Canowindra	Turvey ...	... Fallowed July with disc cultivator, 2 inches deep; harrowed September, disced November; harrowed January; ploughed February 3½ inches deep; harrowed March; springtoothed before sowing.	Second week April.	60	60	Old land.	10·69†	35	17	28	18	8	26	132
A. A. Gorham, Dundungra, Burrowa.	Burrowa ...	Waratah	... Fallowed September 4 inches deep; harrowed December; springtoothed February.	20th May	55	83	First crop.	14·60†	33	17	29	19½	9	23½ (24)	131
D. Bolte, Lincluden, West Wyalong.	West Wyalong.	Waratah	... Springtoothed 4 inches deep June; springtoothed shallow twice in October and again November; skim-ploughed 2½ inches deep December; springtoothed January; scarified twice February and again April with broad points.	16th May	80	90	5	5·62	26	19½	27	19½	10	28½ (29)	130½
Hampton Bros., The Peppers, Young-road, Grenfell.	Grenfell ...	Waratah	... Fallowed July 5 inches deep, harrowed October; scarified and harrowed November; scarified and harrowed February; scarified and harrowed May.	17th to 21st May	70	70	Old land.	8·56	32	19	28½	18½	8	24	130
W. C. Maybury, Beltana, Tullibigeal.	Tullibigeal Agricultural Bureau.	Waratah	... Crop failed 1927; scarified September, again January, and in February and in March.	27th April.	60	60	2	7·73†	28	19	28½	18	8½	25½ (26)	127½
Clarke Bros., Pretty Valley, Burgooney.	Cargelligo ...	Yandilla King ...	Crop failed 1927; springtoothed August and again February.	End April	60	40	2	7·73†	29	16	28	19	10	25 (26)	127
J. W. Hawthorne, Uley, Ardlethan.	Ardlethan ...	Waratah	... Fallowed July 4 inches deep; springtoothed deep September; harrowed January; springtoothed with wide points in March.	1st to 3rd May.	72	75	7	6·69	25	17	28	18	9	28	125
R. Penfold, Edaville Quandialla.	Quandialla	Canberra, 35 acres; Duri, 15 acres.	Fallowed 3½ inches deep August; harrowed September; springtoothed October; again in January and in February.	Mid May	60	60	Old land.	9·00	32	16	27	18	8	24	125
P. C. Henley, South Moon, Ungarie.	Ungarie ...	Waratah	... Fallowed July 3½ inches deep; scarified and harrowed September, in January, and in February.	First week May.	55	65	4	7·21†	25	17	27	17	9	24 (28)	119
J. S. Hume, Tandem Park, Erigolia.	Griffith ...	Federation	... Crop failed 1927; disced February; springtoothed late February; disced March.	Late May	60	60	5	6·25	25	14	25	18	10	26 (29)	118

* First crop, 24 points; second, 25; third, 26; fourth, 27; fifth, 28; sixth, 29; over six crops, 30 points. In parentheses are shown the maximum if below 30.
† Rainfall registrations at a near post office.

The Season.

A very abnormal distribution of the rainfall was experience during the season. There was a super-abundance of rain during the late summer and early autumn, which was responsible for much erosion of fallowed land and for a prolific growth of weeds on the fallows. However, it also gave the fallows a good soaking and ensured ample moisture for an excellent germination and prolific early growth of the crops, and, moreover, provided a reserve of subsoil moisture which, coupled with good cultural methods, ultimately made the production of satisfactory yields possible. The rainfalls during May and June were much below average for these months, but it only needed normal spring rains to ensure bumper yields. Unfortunately, there were practically no serviceable rains registered during August and September, only light showers of little value being xperienced. Early in October these dry conditions, which were accompanied by hot winds, culminated in a windstorm of great severity, which banished all hopes of a bumper harvest. Subsequently, however, the crops which were not too far advanced made a remarkable recovery under the influence of light showers and cooler weather, and at the time of judging, the crops, though short, were well headed, and were estimated to return very satisfactory yields, many crops comparing more than favourably with those produced under normal conditions. Several districts in the estern portions of the division were visited by swarms of grasshoppers during the autumn, and much damage was done to wheat crops in the early stages of growth, rendering it necessary to re-sow the crops—in some instances more than once—and caused farmers to refrain from sowing until there was an assurance that the young crops would be safe from attack. As the ravages of the grasshoppers continued until June, they were responsible for many crops being sown too late to ensure satisfactory results.

In the accompanying table are set out the points awarded to each of the competitors, according to the scale of points adopted by the Royal Agricultural Society, together with particulars of cultivation methods and varieties.

The Leading Crops.

The championship was won by a dense, well-headed, and even crop of the Marshall's No. 3 variety, estimated to yield 38 bushels per acre. Its freedom from weed growth reflected intelligent methods of cultivation. The crop was very pure, and the only disease of any consequence was a little foot rot and take-all. As the early-sown crop had been judiciously fed off with sheep in early July to check any tendency to rankness, the crop was not over tall, and was in a very satisfactory condition for harvesting. The soil on which the crop was produced was a chocolate loam of granite origin, which in its virgin state had been timbered with grey and yellow box.

The crop of Waratah, to which the second prize was awarded, was not any easy crop to judge owing to its lack of uniformity. It was grown in a very undulating paddock, and the greater soil moisture on the lower portions

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of the land was responsible for better germination, more prolific stooling, and vigorous growth, resulting in a much taller and denser crop than on the more elevated levels, some patches attaining a height of 5 to 6 feet. Consequently, there was a great variation in yield, but the average acre yield was assessed at 42 bushels, which was the highest yielding crop in the competition. Unfortunately, this crop was marred by a small infection of bunt and the presence of black oats. There were other diseases present, namely, a little flag smut and foot rot, as well as some stem rust in a portion of the crop. The possible effect that the stem rust may have on the crop, which was quite green at the time of judging, and the probability of lodging and threshing of the over-tall and very dense portions of the crop (the variety also having a tendency to shedding) were responsible for a reduction of points for condition. As the lack of uniformity of the crop in height, density, and yielding capacity was not considered a material disadvantage, a heavy penalty was not imposed under the heading of evenness.

The third-prize winner was a crop of Nabawa, a comparatively new variety to this State, which was estimated to yield 36 bushels per acre. A notable feature was the freedom from flag smut, to which this variety is very resistant. There was, however, a slight infection of take-all, and the purity was marred by a slight admixture of Waratah.

Special mention must be made of the fine crop of Waratah which formed the Barmedman entry, and which was produced on a rainfall of 6·63 inches during the effective period—just half the rainfall experienced by the Cowra crop. Under more favourable conditions, it would have gone close to carrying off the championship, as it scored well under all headings other than yield, and gained the maximum points for freedom from weeds.

Lessons from the Competition.

Cultural Methods.—The methods adopted in the preparation of the fallow were generally of a high standard, and consistent with the peculiarities of the season. The bountiful rains in late summer and autumn rendered several cultivations necessary for the control of weed growth, and in some instances, where the duck-foot scarifier was not available, the use of the disc cultivator had to be resorted to for the destruction of weeds, especially wild melons and *Eragrostis major*, commonly known as stink grass, which is a particular curse on fallowed land, as it grows and comes into ear rapidly and is not readily eaten by sheep when in head. Under normal conditions the use of the disc cultivator usually has a damaging effect on a fallow, especially when the cultivation is performed near the seeding period, for it destroys the compacted seed bed, but this season there was sufficient rain succeeding the cultivation to restore the compactness of the seed bed. It is noteworthy that the fallows which produced the four leading crops in the competition were ploughed to a depth of 5 inches, which goes to prove that such deep ploughing is justified in such well-favoured districts as those in which these crops were located. In drier districts, however, where the

rainfall would probably be inadequate to ensure a sufficiently compacted seed bed, a shallower cultivation is advisable. Moreover, soils which have a tendency to set should be ploughed deeply, whereas there are some soils which are difficult to compact, such as those of a self-mulching character, on which shallow cultivations produce the most satisfactory results. The aim should be to prepare a seed bed that is firmly compacted but not hard, one that is porous but not loose, and to achieve this it is necessary to regulate the depth of ploughing according to the rainfall of the district, the nature of the soil, and the time of ploughing. The crops at Barellan and Barmedman were grown on land that had been treated to a long summer fallow, the initial cultivation being performed in February, 1927, in the former case by means of a mouldboard plough, and in the latter with a duck-foot scarifier. It is interesting to note that the Barmedman crop was awarded maximum points for cleanliness, and that the Barellan crop only dropped half of a point, demonstrating the value of the long summer fallow in dealing with weeds that infest wheat crops. Moreover, the longer fallow period increases the other advantages of fallowing—conservation of moisture and the liberation of plant food.

Varieties.—Waratah, by virtue of its splendid performance in winning nine of the eighteen district competitions and supplying the runner-up and highest yielding crop in the championship, must again, as in previous years, be regarded as the most successful variety in this competition. Nowhere does this variety enjoy greater popularity than in the central south-west districts, and this is justified by its success in the championship competitions held in the last four years, in each of which it has been the predominating variety. In some of the later districts, where a certain amount of damage was caused by rust, it was possible to confirm previous experience that Waratah possesses a degree of rust resistance.

Federation and Yandilla King each supplied two entries for the championship, the former filling fourth place and the latter fifth place.

It remained for Marshall's No. 3 to achieve the distinction of providing the championship crop. This variety is most suitable for the more favoured districts, but is usually outyielded by Yandilla King in drier areas, and, furthermore, the latter is more resistant to flag smut and possesses a stronger straw.

Nabawa has signalled its first appearance in the central south-west championship competition by carrying off the third prize. While being comparatively new to this State, still it is the most extensively-grown variety in Western Australia, and by reason of its high degree of resistance to flag smut under field conditions, coupled with its high yielding capacity, it is safe to predict that it will become one of the most popular varieties in this State. As an indication of its capabilities as a bag filler, the results of trials with this variety conducted by the Department of Agriculture on farmers'

experiment areas throughout the State are interesting. In a total of twenty-eight variety trials during 1926 and 1927, it was the highest yielder in fourteen trials.

Bena again upheld its reputation for high yields in the eastern districts of this division. It is, however, very subject to infection by flag smut, and has not risen above mediocrity in any but well-favoured districts. This season there was probably no variety which suffered so severely from ear-tipping under the influence of the dry conditions and hot winds as Bena.

Seeding Operations.—There was a variation in the time of sowing from the first week in April to 9th June. The late sowing on the latter date was necessitated by reason of the presence of grasshoppers, and proved too late for best results under the conditions which prevailed during the season. The adoption of such a late period for sowing is justified only on rich land of a porous nature or in very late districts, or on land that is infested with seeds of black oats or other weeds which grow concurrently with the wheat crop. In the event of late sowing it is essential to increase the quantity of seed to compensate for the decreased stooling capacity of late-sown crops, and also to increase the application of superphosphate with a view to stimulating rapid early growth and hastening the maturity of the crop. Where good rains are experienced in the early autumn, it is advisable to advance the period of sowing by at least a week. Under such conditions the early sown crops were the most successful this season, and as growers are prone to plan their operations on the experience of the preceding season, there is a danger that there may be a swing next season to the extreme of sowing too early, and it may be advisable to warn them that under average conditions the best sowing period is from the last week in April to the end of May, and that best results may be anticipated from crops sown seasonably.

The average rate of seeding in the championship competitions in the central south-west remains constant. This year it was 65 lb. per acre, as compared with 68 lb. in the preceding year, and 65 lb. in 1926. The individual quantities of seed varied from 55 to 80 lb. per acre, but generally were quite consistent with the stooling capacity and size of the grain of the variety, the district, and the time of sowing. Wider variation occurred in the applications of superphosphate, from 40 to 100 lb. per acre, with an average of 70 lb. per acre, as compared with 78 lb. in the 1927 competition, and 68 lb. in 1926. The indication is that large quantities of superphosphate were of less advantage this season with its favourable start and dry finish than in the preceding season, which was of a somewhat reverse character—dry at the commencement, with copious finishing rains.

Diseases.—The whole of the competitors but one (who used bluestone) adopted the dry copper carbonate method for treating the seed wheat for prevention of bunt. There was freedom from bunt, except for a slight infection in two crops, evidently resulting from imperfect treatment. It

is a practice to heavily penalise crops in which even a trace of bunt is detected, for the reasons that bunt is well within the control of the farmer, and that even a light infection in a crop can result in infecting the whole of the grain harvested from the crop and considerably reducing the value for seed purposes. The early autumn rains provided congenial conditions for the development of bunt, especially in crops sown late, and had it not been that farmers have an excellent weapon of defence in the copper carbonate treatment, the grain of this year's harvest would most assuredly have been greatly reduced in value as the result of bunt infection.

The autumn rains had a reverse effect on flag smut, having a tendency to reduce its ravages by providing compacted seed beds and ensuring a rapid germination which greatly assist in avoiding infection. Flag smut was very little in evidence in the competing crops, and the loss from this cause generally was very light.

Small take-all patches occurred in a few crops, doubtless the result of the dry soil conditions at ploughing time, the cultivation of the soil when in a dry condition being conducive to take-all attack. In eastern districts stem rust was present in some of the crops, but most of the crops were sufficiently advanced in maturity to escape damage. Crops in these districts were infected with rust throughout the greater part of the period of growth, and it was fortunate that favourable conditions of moisture and temperature combined did not occur for its development in the spring, otherwise much damage would have resulted. The lack of rain in the early spring, although limiting yields in some districts, may be regarded as a blessing in disguise in that it staved off the risk of considerable damage being done to the crops throughout the State by rust.

Farmer versus Manufacturer.

Business and industry are organised. Many farmers are yet unorganised. They compete with one another in selling their products to buyers who often stand hand in hand. But when they must buy food and clothing and implements from the business man they run up against organisation and established prices.

Organisation based on the experience of the past and profiting by the mistakes made in years of pioneering presents itself to the farmer as his only salvation. He can choose between organisation and individualism, but if he takes the latter he must find a market for his goods among strong combinations in the large cities which are interested only in the lowest possible prices.

Organisation, it must be remembered, is not perfect. It sometimes makes mistakes for the farmer just as it does for the barons of industry. But the large industrialists seem to be getting along fairly well. One rule they follow: When success in some particular operation is threatened, strengthen your organisation.

Varieties of Wheat and Other Cereals.

Departmental Recommendations for Different Districts.

H. C. STENING, H.D.A., Chief Instructor of Agriculture

THE following are the latest departmental recommendations as to the varieties of wheat, oats, and barley best suited to various portions of the State:—

WHEAT.

Coastal Districts.

[Embracing districts which are specially subject to rust.]

For Hay—

Clarendon, Florence, Firbank, Gresley (early maturing varieties).

For Green Fodder—

Gresley, Florence, Firbank, Clarendon (early maturing varieties).

Sowing for hay should be made later than for green fodder.

Northern Tableland.

[Of which Glen Innes is representative.]

For Grain or Hay—

Genoa (early sowing);
Florence (mid-season and late sowing);
Clarendon (mid-season and late sowing).

For Green Fodder—

Genoa (early sowing);
Florence (early, mid-season, and late sowing);
Clarendon (early, mid-season, and late sowing).

Central Tableland.

[Of which Bathurst is representative.]

For Grain or Hay—

Cleveland (early and mid-season sowing);
Cadia (early and mid-season sowing);
Waratah (mid-season and late sowing);
Gresley (mid-season and late sowing).

For Grain only—

Federation (mid-season sowing);
Canberra (mid-season and late sowing).

Southern Tableland.

[Of which the Monaro, Crookwell, and Batlow districts are representative.]

For Grain or Hay—

Cleveland (early sowing);
Yandilla King (early sowing);
Waratah (mid-season and late sowing).

South-western Slopes and Eastern Riverina.

[Of which Wagga, Temora, Wyalong, and Barellan are representative.]

For Grain or Hay—

Yandilla King (early sowing);
Turvey (early sowing);
Marshall's No. 3 (early sowing, for more favoured districts);
Gresley (mid-season and late sowing);
Waratah (mid-season and late sowing).

For Grain only—

Union (early and mid-season sowing);
Federation (early and mid-season sowing);
Canberra (late sowing).

For Hay only—

Zealand (early sowing);
Baroota Wonder (early and mid-season sowing).

South-western Plains and Western Riverina.

[Of which Deniliquin, Cargelligo, and Hillston are representative.]

For Grain or Hay—

Waratah (mid-season sowing);
Gresley (mid-season sowing).

For Grain only—

Federation (early and mid-season sowing);
Union (early and mid-season sowing);
Canberra (mid-season and late sowing).

Central-western Slopes.

[Of which Dubbo, Gilgandra, Wellington, Cowra, Grenfell, Forbes, and Parkes are representative.]

For Grain or Hay—

Cleveland (early sowing), especially suitable for the cooler portions of this district, such as Coonabarabran;
Yandilla King (early and mid-season sowing);
Turvey (early and mid-season sowing);
Gresley (mid-season and late sowing);
Waratah (mid-season and late sowing).

For Grain only—

Federation (early and mid-season sowing);
Union (early and mid-season sowing);
Canberra (mid-season and late sowing).

North-western Slopes.

[Of which Tamworth and Gunnedah are representative.]

For Grain or Hay—

Cleveland (early and mid-season sowing), especially suitable for the cooler portions of this district, such as Inverell and Delungra;
Currawa (early and mid-season sowing);
Yandilla King (early and mid-season sowing);
Waratah (early and mid-season sowing);
Clarendon (late sowing).

For Grain only—

Canberra (mid-season and late sowing);
Aussie (mid-season and late sowing).

North-west Plains.

[Of which Coonamble is representative.]

For Grain or Hay—

Canberra (mid-season and late sowing);
Florence (mid-season and late sowing);
Clarendon (mid-season and late sowing).

Western Plains.

[Of which Nyngan, Trangie, and Condobolin are representative.]

For Grain or Hay—

Hard Federation (early sowing);
Waratah (mid-season sowing);
Canberra (mid-season sowing);
Firbank (mid-season and late sowing).

For Hay only—

Clarendon (early and mid-season sowing).

Murrumbidgee Irrigation Areas.

For Hay on the Irrigation Areas—

Marshall's No. 3 (early sowing);
Yandilla King (early sowing);
Turvey (early sowing);
Firbank (mid-season and late sowing);
Gresley (mid-season and late sowing).

For Grain on Dry Areas—

Federation (early and mid-season sowing);
Yandilla King (early and mid-season sowing);
Union (early and mid-season sowing);
Waratah (mid-season and late sowing);
Canberra (mid-season and late sowing).

OATS.

The varieties recommended by the Department for the various portions of the State are as follows:—

North Coast.—Algerian (for grazing), Sunrise, Mulga, Buddah.

South Coast.—Algerian, Guyra, Sunrise, Mulga, Buddah.

Central Tableland.—Algerian, Guyra, Lachlan, Mulga.

Northern Tableland.—Reid, White Tartarian, Algerian, Guyra.

Southern Tableland.—Algerian, Guyra, Sunrise, Mulga, Myall, Buddah.

Monaro.—White Tartarian, Algerian, Guyra, Mulga.

South-western Slopes and Riverina.—Algerian, Lachlan, Guyra, Belar, Mulga.

Central-western Slopes.—Algerian, Lachlan, Guyra, Belar, Mulga.

North-western Slopes—Algerian, Guyra, Belar, Mulga.

Under Irrigation.—Algerian, Guyra, Sunrise, Mulga.

Western Plains.—Sunrise, Gidgee, Mulga, Buddah.

BARLEY.

The varieties recommended by the Department are—

Two-row type (commonly called "malting barleys")—Pryor.

Six-row type (commonly called "feed barleys")—Skinless for early winter green feed. Cape and Trabut for green fodder, and grain for stock in the cooler districts.

The following are brief notes on these varieties:—

Trabut.—A rather short, compact-eared barley of the Cape type, with attractive yellow grain. About the same season as Cape.

Cape.—A very largely-grown six-row type variety, ripening early, and with long awns and grains of a bluish-green tint. Though usually regarded as a feed barley, bright samples are suitable for malting purposes.

Skinless.—Awnless, very early; grain very distinct in appearance, as the hull comes off in threshing.

Pryor.—This variety matures about the same time as Cape, and may be sown at the same time. It is a good variety for the wheat districts, as it may be harvested before wheat-stripping starts. It has a head like Kinver, but slightly shorter.

Crop-growing Competitions, 1928.

EXTRACTS FROM THE JUDGES' REPORTS.

Parkes and Adjacent Centres.

H. BARTLETT, H.D.A., Senior Agricultural Instructor, and H. H. ANDREWS, H.D.A.

EXCELLENT germination and growth of the wheat crops until early spring giving promise of record crops, a dry and extremely windy spring and early summer depressing probable yields, and an ultimate harvest exceeding expectations both in yield and grain quality, is a brief history of the wheat-growing period experienced in the central-western districts of which Parkes is the centre.

Wheat crop-growing competitions are ever becoming more popular and more useful, and data are now available pointing to the fact that the "tail" of the present day competitions is the equal of the "head" of similar competitions of a few years ago. The progress of the factors contributing to high yields has been uniform, sustained and general, and it is not now possible without honest endeavour and the application of scientific methods to produce a crop worth entering in a crop-growing competition. Even so, the field of this work is expanding and entries increasing. In addition to the pastoral, agricultural and horticultural associations, branches of the Agricultural Bureau are very active, and there is not a farm but which is well within the sphere of a crop competition. In 1921 only one association conducted a wheat-crop competition, attracting fifteen entries; while in 1928 eleven associations organised competitions, the entries totalling 145.

The effort put forward by the Condobolin Pastoral and Agricultural Association is well worthy of mention. The ripening period there was particularly trying, and although the closing date of entry was the end of August, 1928, not one of the eighteen entries was withdrawn from the judging, and the average estimated yield was 22 bushels per acre. Condobolin is fast becoming recognised as a fine wheat-growing district, and there is no doubt ...r that the rapid progress of the town and district during the past ...sed in the near future.

Rainfall.

...red at each centre during the fallowing period (June, ...) was as follows:—Parkes, 2,391 points; Forbes, 2,139 ...n, 2,050 points; Tullamore, 2,503 points; Trundle, 2,048 ...nil, 2,362 points; Bogan Gate, 1,774 points; and Manildra,

The rainfall during the growing period (April to October, 1928) is shown in detail in the following table :—

	Parkes.	Forbes.	Condobolin.	Tullamore.	Trundle.	Peak Hill.	Bogan Gate.	Manildra.
	points.	points.	points.	points.	points.	points.	points.	points.
April ...	114	231	156	170	176	324	168	175
May ...	76	66	59	28	55	60	75	72
June ...	80	157	85	179	133	184	94	156
July ...	259	230	165	216	165	206	186	257
August ...	87	73	37	36	58	35	68	53
September	34	37	40	7	34	26	49	30
October ...	130	96	118	75	91	86	136	163
Total (growing period)	780	890	660	711	712	921	776	906

Superphosphate.

The following table shows the number of competitors in each competition and the average amount of superphosphate applied per acre. All amounts in this report are based on high-grade superphosphate—22 per cent. water soluble phosphoric acid.

Locality.	Competitors.	Crops Manured.	Crops Unmanured.	Average amount of Superphosphate per acre.
				lb.
Parkes	15	15	...	69
Forbes	22	22	...	58
Condobolin	18	18	...	50
Bogan Gate	19	19	...	65
Tullamore	16	15	1	58
Trundle	11	11	...	65
Peak Hill	5	3	2	59
Manildra	11	11	...	64
Nelungaloo	14	14	...	69
Tichbourne	6	6	...	65
Murrumbogie	8	8	...	52
Totals	145	142	3	...

Statistics collected for each year since 1924 sho localities the amounts of superphosphate per acre tendency is to apply the heavier dressings to the cla soils, though the amounts applied to the lighter and lo behind. Applications of 90 lb. of superphosphate have be results, though in the past season where 100 lb. or mo vigorous dense growth made during the favourable growing w overmuch during the hot dry spring, and particularly from the g

were of weekly occurrence. However, if associated with other favourable factors, 70 lb. of superphosphate per acre is probably the optimum amount to apply.

Seeding.

The following table shows the average amount of seed per acre used when sowing the competition crops in the different centres in each year since 1924 :—

Locality.	1924.		1926.	1927.	1928.
	lb.	lb.	lb.	lb.	lb.
Parkes	52	56	60	60	60
Forbes	59	58	58	66	64
Condobolin	...	...	...	...	58
Bogan Gate	...	56	57	55	60
Tullamore	...	...	48	52	59
Trundle	50	49	52	52	62
Peak Hill	...	49	51	55	50
Manildra	...	...	...	64	61
Nelungaloo	...	...	...	59	57
Tichbourne	...	...	...	56	63
Murrumbogie	...	...	...	...	55

The average amount of seed now used throughout the west is about a bushel per acre; the far west using slightly less, and the nearer west slightly more. Good fallows allow of heavier seeding, but in fallows not so well worked the heavy seeding may not be so successful with a dry spring.

Graded seed of purity and true to type is now universally used in these competitions. Some competitors, however, found difficulty in procuring this quality of seed last season. The system of pure seed supply established in 1924 is being continued with success by commercial growers. The purity of competition crops is largely due to this system, and farmers are advised to avail themselves of this opportunity of obtaining pure seed.

Almost without exception this season the seed was treated with copper carbonate, which has proved so successful as a preventive for bunt that it is extremely rare to find any traces of the disease in the crops. How this treatment of seed wheat has grown in favour in recent years is well demonstrated by statistical records, which show that in 1924 only 40 per cent. of the competition crops were treate with dry copper carbonate, while in 1928 the percentage had increased to 97.

It is noticeable that diseases are becoming less menacing under scientific farming. In the central-western district this year flag smut was the only disease at all prominent. Foot rot and take-all were not much in evidence, while copper carbonate has effectively controlled bunt. Loose smut was in evidence in a few plots. Nabawa, the flag smut resistant wheat, has again maintained its reputation in this district.

Varieties.

The outstanding varieties were Waratah, Canberra, Federation and Bena. Last season (1928), 46·8 per cent. of the crops exhibited were of Waratah variety, 14·8 per cent. Canberra, 10 per cent. Federation, and 7·2 per cent. Bena. The growing popularity of Waratah is evidenced by the fact that in 1924 it comprised only 3·5 per cent. of the varieties exhibited, while in that same year 28 per cent. of the competition crops were of Canberra variety.

The proportion of late varieties grown in the Parkes and Forbes districts in 1928 was 30·2 per cent., as against 14·7 per cent. in the more western districts of Condobolin, Tullamore and Trundle, which indicates that the early maturing varieties proved more suitable, during the 1928 season, to these latter districts with their generally lighter soils. From observations it appears that the later maturing varieties are more successful on the heavier soils.

The placing of the varieties in the ten competitions was as under :—

TABLE Showing the Placing of the Different Varieties.

Variety.	No. of Entries.	No. of Placings. 1st.	2nd.	2rd.
Waratah	67	7	8	7
Canberra	21	1	...	1
Federation	14	1	...	1
Bena	10	...	...	1
Gresley	6	...	1	...
Nabawa	2	1	...	...
Sultan	1	1	...	...
Hard Federation	2	...	1	...
Turvey	3	...	...	1

Calculating points on the basis of 3 for first place, 2 for second, and 1 for third, Waratah scored 44 out of a possible 66, or 66 per cent.

With a total of 145 entries, twenty different varieties were submitted for inspection. The advantages to be gained by a reduction of the number of varieties are obvious, particularly from the viewpoint of pure seed supply.

Cultural Methods.

In the following table are shown the number of crops grown on fallowed and stubble land in each competition and also the average number of times the fallow was worked in each locality. The ploughing or initial working of the ground and the sowing operation, if sown with a seed drill, have not been included in the number of workings. Where the combined drill was used, however, it has been counted as a working. Areas which were sown in 1927 and failed completely and the soil prepared early for the 1928 crop, have been classified as a fallow.

TABLE Showing Number of Crops on Stubble, &c.

Locality.	No. of Crops exhibited.	Crops on Fallow.	Crops on Stubble.	Average No. of times fallow worked.
Parkes	15	15	...	7·7
Forbes	22	18	4	4·1
Condobolin	18	10	2	3·4
Bogan Gate	19	19	...	7·3
Tullamore	16	16	...	4·4
Trundle	11	10	1	6·7
Peak Hill	5	5	...	3·6
Manildra	11	8	3	3·0
Nelungaloo	14	14	...	6·1
Tichbourne	6	5	1	4·8
Murrumbogie	8	7	1	4·4

The improvement in the fallows and particularly in the number of workings is being maintained. Several of the fallows received ten, eleven, and even twelve workings in preparation for the 1928 sowing.

Summary.

In 1926, the average yield of the leading seven crops was 32 per cent. greater than that of the next twelve crops; 37 per cent. greater in 1927, and 18 per cent. in 1928.

The outstanding factors giving such increases were :—

1. The continued use of large amounts of superphosphate. The use of superphosphate shows a continued increase, the amount being 73 lb. per acre for the leading seven crops of 1928.
2. The frequency of the workings of the fallows. In 1926, the fallows producing the leading seven crops and the twelve supplementary crops were worked 6·6 and 4·75 times, respectively, an increase of 1·85. In 1927, the times worked were 8·4 and 4·9, an increase of 3·5 times, and this year (1928) 9 and 6·6 times, an increase of 2·4 times. The average number of workings in 1928 was greater than in 1927 or 1926.

There has been no increase in the amount of seed sown, it being still about 1 bushel per acre.

Frequent and judicious working of fallows, coupled with liberal use of graded seed and superphosphate, are the factors largely contributing to the increased yields in the various crop competitions.

Dubbo and Adjacent Districts.

B. M. ARTHUR, H.D.A., Senior Agricultural Instructor.

Though the past season has been unfavourable in many parts of this portion of the western district, five local associations, namely, Cumnock, Dubbo, Gilgandra, Narromine and Wellington, also Eumungerie Agricultural

Bureau, conducted crop competitions this year. The entries totalled over ninety, but there were a few withdrawals at the last moment. The number of entries, taking adverse seasonal conditions and grasshoppers into consideration, was excellent, and was well up to the average of other years in most centres. Wellington's total of twenty-five entries was by far the greatest number ever received at that centre, and was the outcome of a determined effort by the committee to stimulate interest in their local crop competition for the benefit of the individual competitor and the good name of their district.

The promotion of competitions, covering nearly all branches of primary production, is to-day found to be one of the best means of educating farmers in the finer points of their calling or profession, so as to enable them to obtain the maximum returns from their soils under varying climatic conditions. These competitions also create a healthy spirit of rivalry, which tends to encourage the winners to try and maintain their position and the losers to attempt to do better, which is all for the economic good of the individual and the district he lives in. Therefore, it would appear that competitions to encourage increased production must necessarily be one of the main functions of all agricultural associations in their efforts to assist the community, in whose interests they function.

The Season.

Once again the wheat-grower has had abnormal conditions to contend with, and it would seem, in the light of experience of the past few years, that dry spring conditions are the rule rather than the exception. If this is so, then the farmer must alter his practices to suit such conditions, and this involves the early preparation of soils to store up a reserve of soil moisture and necessary plant foods, early sowing of the proper varieties so as to have the plants well established before the colder weather sets in, and the application of superphosphate to stimulate root growth and so enable the wheat plant to be well grown and set by the end of the winter, thus making it possible for the plants to carry on and mature a payable crop in spite of lack of moisture during the spring months.

The dry winter of 1927 did not allow fallows to be started under auspicious circumstances, and in several cases prevented ploughing from being undertaken until the advent of suitable rains early in October. Heavy rains during November, when harvesting operations were in progress, did not allow of full advantage being taken to conserve this moisture and prevent weed growth. Then followed frequent and heavy rains during January and February, which brought about an unprecedented and excessive growth of weeds, particularly *Eragrostis major* (stink grass). In many cases this proved very difficult to deal with without turning it under, which would have made the seed bed too open and loose. These heavy rains also caused a good deal of soil erosion on undulating to hilly country. March was reasonably dry, and good rains during April enabled seeding operations to

take place under almost ideal conditions, and an excellent germination was obtained practically everywhere. But an unlooked-for pest in the form of grasshoppers arrived in many parts of the district and ate out the young well-germinated wheat areas, many of which had to be re-sown (in some cases a third time), and a further area, though not re-sown, was thinned out to such an extent that the ultimate yield could not be anything but light. Every re-sowing meant delay and loss of moisture, and as May was a fairly dry month, patchy germination resulted in such cases. Good rains during June and July were sufficient for crop requirements, but from late July till mid-October the rainfall was practically negligible and of no value to crops. By this time the crops in the more western portions of the district were too forward to receive any benefit, and they had ripened off unusually early, with consequent frequent pinching of the grain.

Crops to the east and south of Dubbo were generally later, and received considerable benefit from light falls of rain during mid- and late-October. A severe windstorm on 7th October did untold damage to many crops, while hailstorms were also responsible for additional losses in several localities Grasshoppers again hatched out in large numbers in the early spring, and although a fair effort was made by individual and concerted action to control them, they were too numerous and the efforts were not consistent. Consequently, in many localities they have been responsible for considerable damage to green crops, stripping them of all flag, and frequently chopping off the ear.

All these factors have tended to reduce the prospective average yields of the district to below that of the State average, and it is interesting to note that the estimated apparent yield of all competition crops varies from 16½ bushels at Eumungerie and 18¼ at Gilgandra to 28½ bushels average at Wellington and Cumnock, with an average for all crops of 24 bushels, This again is a striking object lesson of the manifold advantages of fallow and other better farming methods.

The rainfall for the fallow and growing periods at the various centres was as follows:—

RAINFALL at Various Centres.

	Cumnock.	Dubbo.	Gilgandra.	Narromine.	Wellington
	points.	points.	poins.	points.	points.
Fallowing period (July, 1927, to March, 1928)	2,104	2,104	1,696	2,353	2,211
Growing Period—					
April	206	189	51	205	298
May	48	45	27	37	62
June	149	214	107	103	132
July	265	228	218	234	243
August	27	31	17	30	34
September	34	15	21	12	31
October	136	57	104	533	89
Total (growing period)	855	779	545	674	889
Grand Total ...	2,959	2,883	2,241	3,027	3,100

Cultural Details.

Sixty out of the eighty-five entries were sown on fallows prepared during 1927, and of the balance many were worked up early after the crops sown in 1927 had failed and been fed off, therefore this virtually constituted an enforced fallow. A few were commenced in the previous summer and autumn as a long summer fallow, but the majority were prepared during July and August.

Mouldboard ploughs were slightly more in favour than discs for the initial ploughing, particularly in the Wellington and Cumnock districts, the proportion being forty to thirty-three. In addition, twelve were given a first working with the rigid-tined scarifier, which is gradually coming into favour, or the springtooth combine.

Cultivations were given mostly with springtooth combines or cultivators and harrows, but the various disc cultivators were also frequently used. These implements are often the cause of poor results being obtained on early ploughed land, for the reason that the depth of working cannot be adequately controlled, and they often spoil the previously well performed work of the farmer by making the seed bed too loose and fine just prior to sowing.

The following table shows the proportion of crops on fallow and the average number of workings given. Where the crop was sown with a combine it has been counted as a working:—

TABLE Showing Number of Crops on Stubble, etc.

District.	No. crops exhibited.	Crops on fallow.	Crops on stubble.	Average number of times fallow worked.	
				1928.	1927.
Cumnock	14	10	4	4·8	3·2
Dubbo	15	15	...	6·6	5·8
Gilgandra	15	7	8	4·6	4·3
Narromine	8	8	...	6·25	5·5
Wellington	25	15	10	5·86	2·5
Eumungerie	8	5	3	4·7	...
Totals	85	60	25	5·5	4·2

The above table shows that in every district there is an increase in the amount of work put into the fallows this year compared with last year. This is partly due to the frequent summer rains necessitating more workings to keep down weeds and provide a suitable mulch, but it also points to the fact that the advisability of working the ground, when necessary, is becoming more widely recognised as a means of bringing about the essential soil consolidation.

Seventy-six of the crops were sown with combines, and only nine with seed drills. This is interesting and shows how rapidly the combine drill has grown in favour.

Time and Rate of Seeding.

All competition crops were sown by the middle of May, and the majority of them from mid-April to early May. This again bears out the contention that, in this part of the western district, early seeding pays best. The advantages, where conditions are suitable for an early germination, are that the plants get well established in comparatively warm soils, which encourages root and surface growth, and they are then in a position to stand up better to adverse conditions that may be experienced during the winter and spring months. On the other hand, late sown crops do not always germinate satisfactorily in cold soils, do not stool well, and are more subject to the vagaries of the season.

The average amount of seed per acre sown by competitors in the more favoured districts of Cumnock, Wellington and Dubbo has remained fairly constant (round about one bushel) in recent years, but at Gilgandra and Narromine, in the drier portions of the wheat belt, there has been a progressive increase each year, which is in keeping with the trend of modern farming practices to increase the amount of seed used.

TABLE Showing Average Amounts of Seed Sown by Competitors.

District.	1925.	1926.	1927.	1928.
	lb.	lb.	lb.	lb.
Cumnock	57	57	60	58
Dubbo	55	53	58·6	55
Gilgandra	47	53	55	57
Narromine	45	48	51·5	57
Wellington	56	55·5	60	60
Eumungerie ...	...	...	...	57

The advantages of graded pure seed is now well recognised, and the standard of seed in the majority of cases was high; only a few competitors have not yet realised the importance of this factor in the production of big yields.

Seed Treatment for Bunt Prevention.

Of a total of eighty-five entries, the dry copper carbonate treatment was used in eighty-one cases (95 per cent.), formalin in two cases, bluestone in one case, and no treatment at all in one case. These figures demonstrate how rapidly the outstanding advantages of the dry copper carbonate treatment for bunt, or stinking smut, prevention has received recognition by farmers, who are prepared to adopt anything to their advantage.

The percentage of crops dry-treated was 95 in 1928, as compared with 83 per cent. in 1927 and 78 per cent. in 1926.

Bunt was not seen in any crop inspected, and has not been found in any crop treated with copper carbonate for the past three years.

Varieties of Wheat Used.

The varieties placed in each of the competitions were as follows:—

District.	First place.	Second place.	Third place.
Cumnock	Yandilla King	Waratah	Waratah
Dubbo	Hard Federation	Nabawa	Waratah
Gilgandra	Bena, Nabawa, and Federation.	Wandilla	Waratah
Narromine	Waratah	Waratah	Nabawa
Wellington ...	Turvey	Yandilla King	Yandilla King
Eumungerie ...	Yandilla King	Waratah	Hard Federation

Yandilla King has the best record with two firsts, one second and one third, though Waratah has been the most consistent place-getter with seven places. Nabawa and Hard Federation also did well.

Altogether nineteen different varieties were exhibited, and by far the most popular was Waratah with twenty-six exhibits, comprising 30 per cent. of the total.

In the more easterly portions of the district the slower maturing varieties seem to do best, owing to their better stooling qualities and to the fact that they invariably obtain considerable benefit from late spring rains. On the plains and lighter soils the quicker maturers generally can be depended on to yield consistently. Of the nineteen varieties exhibited, seven were late maturing, five mid-season and seven fast growers. Although the number of varieties is large, and it would appear desirable to cut them down somewhat by elimination, yet all the above-mentioned varieties have done well in certain localities, and as they favour certain types of soils, it is hard to know where to start.

Fertilisers.

The following table shows the amount of superphosphate used this year in comparison with past years:—

District.	No. of Crops manured.	Average quantity used.			
		1925.	1926.	1927.	1928.
		lb.	lb.	lb.	lb.
Cumnock	12 out of 14	51	47	57	52
Dubbo	13 ,, 15	54	57	65	54
Gilgandra...	8 ,, 15	53	57	50	57
Narromine	7 ,, 8	42	43	51	60
Wellington	12 ,, 25	49	50	...	53
Eumungerie	8 ,, 8	...	...	...	42

The percentage of farmers who applied varying amounts of this invaluable aid to increased yields was 70·6 of the total competitors, but this percentage would be well above the general average for the whole district, including all farmers whether competitors or not. It is not easy to understand why

superphosphate is so slow in receiving proper recognition, even allowing for the fact that there is still considerable room for improvement in the farming practices adopted, and it goes without saying that the better the farmer the more the superphosphate will assist him. On the other hand, it will not make up for poor farming practices. The tendency of those who do use it is to increase the amounts applied each year as they acquire a better understanding of its requirements and action. Its main action is in stimulating the early root growth, thus enabling the plant to draw on a larger area of soi for its moisture and plant food requirements in solution. Its main requirement is an adequate supply of moisture, either by storage in the soil or by frequent precipitation, so that the plants do not get any check in their growth. Until it becomes more universally used, a safe recommendation is an average amount of 56 lb. per acre on all fallowed land.

Diseases.

Diseases of the wheat plant have again taken their toll of crops, though the general loss was not particularly serious this year. By far the worst disease was flag smut (*Urocystis tritici*), and it was to be found to a greater or lesser extent in nearly every crop, some varieties being more liable to it than others, namely, Canberra, Hard Federation, Waratah, Turvey, Bena, Duri, Aussie, &c. On the other hand, a certain few varieties show a high degree of resistance to the disease under field conditions, namely, Nabawa, Wandilla, Riverina, Bunyip, Florence, and Penny, and many farmers are using one or more of the first three of these varieties in order to avoid serious losses from this troublesome disease.

In the Cumnock district foot rot and take-all are generally to be found, but do not cause any great losses. Other parts are practically free from these diseases. Sometimes loose smut is frequently to be seen to a fairly large extent, but the loss is small compared with flag smut.

Powdery mildew developed in many rank crops during the winter, also leaf rust, and they may have been the forerunner of other more serious troubles such as stem rust, but the dry spring conditions precluded any possibility of its developing, and the mildew also disappeared.

Frost at the flowering stage again did a certain amount of damage to some crops, but it appears impossible to avoid this, except where varieties are palpably sown out of season, as one cannot predict when frosts are going to occur.

The South-western District.

G. NICHOLSON, H.D.A., Agricultural Instructor.

CROP competitions were conducted by the following societies:—Lake Cargelligo, Tullibigeal, Ungarie, Barellan, Ariah Park, Cootamundra, Young, and Murrumburrah.

In addition to two competitions for the best farm of growing crops, totalling in all 6,000 acres of crop, 183 fifty-acre blocks were inspected. The districts cover a wide range of soil and climatic conditions and comparisons are interesting.

Interest was well maintained in the competitions, particularly in the western districts. As usual, rivalry was particularly keen at Ariah Park and Barellan, and Lake Cargelligo, which did not conduct a competition last year, was well to the fore this season. It is disappointing to note the falling off in the number of competitors in the Cootamundra, Young, and Murrumburrah districts. In all probability, if a novice class for farmers who had never won a competition was organised by these societies, interest would be renewed.

As a whole, the standard of the crops submitted, which were in most instances of good commercial value, was not what might be expected of first-class competition crops.

The Season.

A season perfect in every detail is seldom if ever experienced. Each year conditions vary and new problems arise. With special reference to the western districts, conditions prevailing during the past year have been phenomenal. Outstanding features were floods in February, grasshoppers during the seeding period, a low winter rainfall, and an early harvest.

In most instances the dry winter of 1927 enabled farmers to fallow early with a minimum of delay. The favourable rains during early October provided ideal conditions for working the fallows to advantage prior to harvest. For the first three months of the present year (1928) heavy rains were recorded, falls ranging from 22 inches at Ungarie and 14·62 inches at Ariah Park to 8·34 inches at Young. Large areas of level country were inundated and the fallows received a thorough soaking. At the same time the heavy rains were responsible for surface erosion, throwing the fallows entirely out of condition and inducing an exceptionally heavy growth of weeds and herbage. Farmers who, by heavy stocking and timely cultivation, kept the weed growth in control were amply repaid for the extra expense involved. The rainfall from mid-April to May was of no consequence, hence final cultivations and seeding were done under favourable conditions. Although the rainfall for the gowing period was below the average, districts which escaped the grasshoppers had a good season.

At Ungarie, Tullibigeal and Barellan grasshoppers were present in plague numbers, in some instances until the middle of June. Partial crop failures may be attributed to grasshoppers rather than to lack of rainfall. Many seasonably sown crops were completely eaten out and had to be re-sown. In order to avoid the depredations of the grasshoppers some farmers refrained from sowing until late May and early June. The past season, however, has been essentially an early one, and early-sown crops have come out on top. In the grasshopper-infested areas early sown crops which escaped the attack gave excellent returns, whereas re-sown crops were often disappointing.

A mild winter in combination with sufficient rainfall to meet immediate requirements encouraged a rapid growth of the crops. By August crop prospects everywhere were exceedingly bright, but during September the continued dry spell, hot weather, and incessant boisterous winds adversely affected the growth of the crops. With a return to cooler conditions in October the crops made a remarkable recovery and finished off ahead of expectations.

In the Murrumburrah and Young districts quite a number of crops were seriously affected by late frosts. Despite the fact that the spring was particularly dry, indications of rust attack were numerous. Had normal rains fallen there is little doubt that many crops would have been ruined.

RAINFALL on Fallows and Growing Crops at the Various Centres.

	Lake Cargelligo.	Tullibigeal.	Ungarie.	Barellan.	Ariah Park	Murrumburrah.	Young.	Cootamundra.
	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
Fallowing period (June, 1927, to March, 1928)	22·06	22·03	28·97	18·99	23·29	18·94	22·33	18·69
Growing Period—								
April	1·03	·78	1·66	1·87	1·28	2·76	3·69	2·08
May	·71	·82	·95	1·39	·45	·95	1·02	1·21
June	1·48	·65	1·42	·51	·93	1·62	·90	1·68
July	2·38	2·08	1·91	1·35	1·69	3·55	2·87	3·89
August	·14	·38	·87	·45	·65	·68	·91	·52
September ...	·43	·50	·32	·35	·35	·62	·80	·77
October	1·56	·69	·53	·94	1·08	1·46	1·26	·97
Total (growing period) ...	7·73	5·90	7·16	6·86	6·43	11·64	11·45	11·12
Grand Total ...	29·79	27·93	36·13	25·85	29·72	30·58	33·78	29·81

Varieties.

No less than twenty-eight varieties were inspected. The following table shows the number of times varieties were placed :—

Variety.	No. of Entries.	Firsts.	Seconds.	Thirds.	Total Placings.
Waratah	46	4	7	3	14
Yandilla King	36½	4	1	2½	7½
Turvey	22	...	1½	1½	3
Bena	10	1	1	1	3
Marshall's No. 3	8	1	1	...	2
Federation	11	1	...	½	1½
German Wonder	3	...	½	1	1½
Currawa	3	...	...	1	1
Carmichael's Eclipse	1	1	...	...	1
Canberra	2	...	...	1	1
Hard Federation	1	...	...	½	½

AVERAGE Yields at the Different Centres.

Average of—	Lake Cargelligo.	Tullibigeal.	Ungarie.	Barellan.	Ariah Park.	Murrumburrah.	Young.	Cootamundra.
	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.
All competition crops	19	20	19	22	23	28	29	32
First three crops ...	24	26	24	28	31	36	31	37

Twenty-five per cent. of the entries consisted of Waratah, Yandilla King 20 per cent., Turvey 11 per cent., and Federation and Bena 5 per cent. each. Waratah continues to be the most favoured variety in both the early and late districts. Susceptibility to flag smut and tendency to shell are its two main defects, but despite these it fills the bags, hence its popularity.

For early sowing Yandilla King is by far the best late maturing variety grown in the south-west. Even in the very early districts it is giving excellent results, but should be grown only on fallow and, for preference, on the heavier types of soil. In the drier districts difficulty is often experienced in obtaining a satisfactory germination. Marshall's No. 3 continues to give good returns in the later districts, but west of Temora it is not favoured. Bena has the capacity to yield when conditions are favourable, and it will not stand a dry spring to the same extent as most other popular varieties. The greater number of Bena crops showed considerable variation of type, the variety apparently not breeding true. The popularity of Turvey appears to be waning on account of flag smut infection and to the fact that it seldom yields up to expectations. This season it tipped badly in many places. Of the other varieties, Federation, Penny and Currawa gave good results. The Nabawa crops were disappointing, due mainly to being sown out of season and on dirty paddocks.

There is a tendency on the part of farmers to grow far too many varieties. Twenty-eight varieties were exhibited and of these at least twelve should be eliminated. Better returns would be obtained if only standard varieties were grown and more attention paid to the type and purity of the seed used.

Trueness to Type and Purity of Seed.

The type and purity of seed used by the greater number of competitors were not up to pure seed standard. A crop to be passed for pure seed must score not less than 90 per cent. for purity. Only 12 per cent. of the entries were up to standard.

Due to drought conditions last year many farmers in the west were compelled to purchase seed supplies in the open market, and some samples were badly mixed. A farmer who contemplates purchasing seed from the owner of a winning crop should first of all ascertain the number of points scored for purity.

Seed Treatment.

Dusting of seed wheat with copper carbonate for the prevention of bunt has superseded the formalin and bluestone treatments. One hundred and seventy-five entries were dry pickled, six pickled with either bluestone or formalin, and two were not treated. With one exception the incidence of bunt infection was of no consequence. The badly infected crop was the result of treating smutted seed with bluestone pickle, and re-infection had taken place before germination. The efficaciousness of the dry pickle depends on the thorough dusting of the seed.

Rate of Seeding and Manuring.

The average quantity of seed per acre sown at the various centres was as follows:—Lake Cargelligo, 54 lb.; Tullibigeal, 61 lb.; Ungarie, 57 lb.; Barellan, 75 lb.; Ariah Park, 83 lb.; Murrumburrah, 71 lb.; Young, 60 lb.; and Cootamundra, 70 lb. During the past season heavy seeding was a disadvantage, the plants tending to be too crowded and failing to develop well-filled heads. In the drier districts there has been a general tendency in recent years to follow the Victorian practice of heavy seeding. This has proved a doubtful advantage in dry years and farmers are favouring a lighter rate of seeding.

The average amount of superphosphate used at Lake Cargelligo was 56 lb. per acre, 58 lb. at Tullibigeal, 55 lb. at Ungarie, 60 lb. at Barellan, 65 lb. at Ariah Park, 64 lb. at Murrumburrah, 64 lb. at Young, and 72 lb. at Cootamundra. On the older land and on well-worked fallow a liberal dressing of 70 to 80 lb. superphosphate will give payable results. At Lake Cargelligo and Tullibigeal from 50 to 60 lb. of superphosphate is sufficient for most types of soil. To obtain maximum results from superphosphate a well-prepared fallow is necessary—the fertiliser will not compensate for lack of cultivation.

Cultivation.

The greater number of crops were sown on fallow which had been ploughed in June and July, or earlier. At Lake Cargelligo, Tullibigeal and Ungarie numbers of crops were sown on two years' fallow, the crops having failed last year.

It was pleasing to note that, despite the wet summer, the disc cultivator was used only on twenty-eight blocks, and in most instances it was used only once. The springtooth is most widely used for cultivating the fallow. While this is an excellent implement to use early in the season, the scarifier is to be preferred for the later cultivations. Sixty-six blocks were cultivated once or more with the scarifier.

With the exception of areas damaged by grasshoppers, the results of the combined fallow and crop competitions have been very satisfactory. In connection with combined competitions, competitors should bear in mind

that a promising fallow does not necessarily assure a perfect crop, but it is the foundation on which a good crop can be grown. A fallow may be partly ruined by a faulty working or the omission of a vital cultivation, and the chances of securing a good crop ruined by sowing unsuitable varieties out of season.

The combine for sowing was used on 141 blocks, and the hoe or disc drill on forty-two blocks. On the undulating and lighter soils in the Murrumburrah and Young districts the drill is still very much in favour. The combine is a time-saver, but, unfortunately, it is too often expected to do the work of a scarifier and a drill in the one operation. A patchy germination and a dirty crop is often the result. Provided it is correctly used it will give excellent results, but it has tended towards the neglect of fallows near seeding time.

Diseases.

Foot rot was more prevalent this season, particularly on old paddocks. With a few exceptions the amount of flag smut infection was not heavy. A loose open seed bed appears to favour the development of flag smut. Nabawa is very resistant to attack, and Yandilla King and Wandilla are fairly resistant. Some crops of Onas, Turvey, Canberra and Bald Early were badly affected. Slight damage occurred during the winter months due to the development of mildew in early sown crops.

The North-western District.

J. A. O'REILLY, H.D.A., Agricultural Instructor

The agricultural associations at Gunnedah, Narrabri, Wee Waa, Moree, and Inverell conducted crop competitions during the past season and the response on the part of the growers was most encouraging. The competition at Boggabri was taken up by branches of the Agricultural Bureau, the best crop being eligible to compete for R.A.S. honors.

The Season.

The subsoil was thoroughly saturated as a result of the heavy precipitation during the first three months of the year. The rain during the sowing months (April and May) was light, but in most cases a satisfactory germination was obtained. Good growing conditions prevailed during June and July, but the rainfall in August and September was almost negligible throughout the whole of the district. The manner in which the crops held out during this critical time well indicates the remarkable water-holding capacity of the soils of the north-west, and also shows that the growers are appreciating the benefits which accrue from the adoption of better methods of handling the fallows.

RAINFALL at the Different Centres.

—	Gunnedah.	Boggabri.	Narrabri.	Wee Waa.	Moree.	Inverell.
January	142	268	90	221	350	538
February ...	579	597	697	574	526	629
March	592	487	544	422	418	186
April	207	143	182	81	190	191
May	0	24	66	21	44	80
June	302	333	396	252	378	460
July	250	226	241	213	234	294
August	0	0	0	6	0	0
September ...	5	0	7	0	7	7
October	97	96	75	6	55	257
Totals ...	2,174	2,174	2,298	1,796	2,202	2,642

Cultivation.

Of the eighteen leading entries in the six competitions, the initial working was given with the disc implement in twelve cases, four with the mouldboard, and two with the springtooth cultivator. Subsequent workings were done in most cases with the disc and springtooth implements. It is significant that land which carried the leading crops at Gunnedah, Inverell and Moree was worked subsequently with the rigid-tine scarifier. This seems to substantiate the claim that the use of the rigid-tine implement results in a firmer and level seed bed, underlying a more even depth of mulch.

The average number of times the fallows were worked are as follows:—Gunnedah, 5; Boggabri, 5·8; Narrabri, 3·1; Wee Waa, 2·9; Moree, 4·6; and Inverell, 5.

Varieties.

Nineteen different varieties were included in the seventy-five entries, and of these Waratah made up over 40 per cent. As with other portions of the State (allowing for a few minor defects), Waratah has become a popular and useful variety in the north-west. Hard Federation, Aussie, and Canberra find favour with many of the growers.

The Inverell district is climatically suited to the late maturing variety Cleveland, and in the thirteen crops inspected it was represented six times.

The placing of the varieties in the six competitions is shown in the following table:—

Variety.	Number of Entries.	Firsts.	Seconds.	Thirds.	Total Placings.
Waratah	33½	3½	4½	2	10
Hard Federation	8	½	1½	...	2
Cleveland	6	1	...	1	2
Canberra	5½	...	...	...	...
Aussie	4⅚	...	...	1	1
Wandilla	3	1	...	...	1
Queen Fan	2½	...	...	...	...
Nabawa	1½	...	...	...	...
Currawa	1⅓	...	...	...	...
Perfection	1	...	...	...	...
Pusa	1	...	...	...	...
Bobin	1	...	...	1	1
Union	1	...	...	...	...
Duri	½	...	...	...	...
Comeback	½	...	...	...	...
Chilian Wonder	½	...	...	...	...
Clarendon	1½	...	...	...	...
Florence	1½	...	...	1	1
Marshall's No. 3	⅓	...	...	...	...

Trueness to Type and Purity.

A decided improvement has been noted in this direction and only in a few instances were the crops not up to pure seed standard. These were varieties which have been grown for some years without a change of seed, and owing to the shortage of seed in the district last year farmers were obliged in some cases to rely on seed, the source of supply of which was somewhat questionable.

Seed Treatment.

The use of copper carbonate as a preventive for bunt has become almost universal. Of the fungicides used copper carbonate figured in sixty-five instances, and bluestone and formalin once each. Treatment of seed was neglected in eight cases.

Time of Sowing and Rate of Seeding.

The time of sowing of the more prominent varieties is shown in the following table:—

——	Gunnedah.	Boggabri.	Narrabri.	Wee Waa.	Moree.	Inverell.
Waratah ...	10th April to 14th May.	30th April to 22nd May.	14th April to 26th May.	29th April to 29th May.	15th April to 27th May.	4th April to 16th June.
Aussie ...	......	......	25th April ...	13th April to 29th May.	......	......
Canberra ...	......	4th May ...	20th April ...	15th May ...	28th May ...	15th May.
Hard Federation.	15th April to 2nd May.	29th April to 18th May.	4th to 15th April.	4th to 15th May.	......	......
Cleveland ...	......	......	......	......	......	1st May to 15th June.
Wandilla ...	29th April ...	......	......	14th to 15th April.	......	......

The average rate of seeding at the various centres was as follows:—Gunnedah, 42·4 lb.; Boggabri, 53·4 lb.; Narrabri, 46 lb.; Wee Waa, 55·6 lb.; Moree, 51·3 lb.; and Inverell, 54·2 lb.

Superphosphate does not as yet play an important part in the production of better crops in the north-west. Of the seventy-five crops submitted only one received a light application of superphosphate.

Diseases.

The crops generally were very free from disease. In isolated cases flag smut was prevalent, but the effects of other diseases, such as foot rot, take-all, and loose smut were negligible. No bunt was noticed in any of the crops inspected.

Flag smut is a disease that must be reckoned with by wheat-growers in the north-west, and consideration should be given to such control measures as the growing of oats as a rotation crop, the use of more resistant varieties, and the adoption of a system whereby a third of the cropping area will be winter-fallowed each year.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1929.

Perry	Feb.	1, 2
Eden (H. P. Wellings) ..	,,	7, 8
Wollongong	,,	7, 8, 9
St. Ives (F. Clarke)	,,	8, 9
Tahmoor	,,	8, 9
Leeton (W. Rosewarn)	,,	12, 13
Nowra	,,	14, 15, 16
Castle Hill (W. H. Taylor) ..	,,	15, 16
Newcastle (E. J. Dann)	,,	19 to 23
Milton	,,	20, 21
Blacktown (A. J. Greenaway) ..	,,	22, 23
Robertson	,,	22, 23
Dorrigo (J. H. Skeoch)	,,	26, 27
Macksville (W. G. Hughes) ..	,,	26, 27
Maitland (M. A. Brown)	,,	27, 28, Mar. 1, 2
Oberon (C. S. Chudleigh) ..	,,	28, Mar. 1
Moss Vale (W. Holt)	,,	28, Mar. 1, 2
Taralga	,,	28, Mar. 1
Penrith (C. H. Fulton)	Mar.	1, 2
Tumut (H. Mount)	,,	5, 6
Coonabarabran (C. D. Cox) ..	,,	5, 6
Crookwell	,,	5, 6, 7
Braidwood (R. L. Irwin)	,,	6, 7
Cessnock (Bill Brown)	,,	6, 7, 8, 9
Bowral Horse Show	,,	8, 9
Campbelltown (W. N. Rudd) ..	,,	8, 9
Rydal (H. Murray)	,,	8, 9
Luddenham (J. McKnight) ..	,,	8, 9
Penrose (C. E. Brice)	Mar.	9
Gundagai (P. J. Sullivan) ..	,,	12, 13
Molong (W. P. Stanger)	,,	12, 13
Bombala (P. J. Jonas)	,,	14, 15
Camden	,,	14, 15, 16
Mudgee (O. Wilkins)	,,	14, 15, 16
Goulburn (T. Higgins)	,,	14, 15, 16
Granville (B. Hyslop)	,,	15, 16
Tumbarumba (M. Kinstler) ..	,,	19, 20
Kempsey (E. Mitchell)	,,	19, 20, 21
Muswellbrook (R. C Sawkins) ..	,,	19, 20, 21
Wallamba (E. A. Carey)	,,	21, 22
Liverpool (B. C. Fitzpatrick) ..	,,	22, 23
Warringah (F. L. Parker) ..	,,	22, 23
Wingello (J. E. Creelman) ..	,,	23
Batlow (C. S. Gregory)	,,	26, 27
R.A.S., Sydney (G.C. Somerville)	,,	27 to Ap. 6
Orange (G. Williams)	April	16, 17, 18
Wingham (D. Stewart)	,,	17, 18
Grafton (L. C. Lawson)	,,	17 to 20
Hawkesbury (R. B. Tate) ..	,,	18, 19, 20
Maclean (T. B. Notley)	,,	23, 24
Stroud (C. E. Price)	,,	26, 27
Dungog (W. H. Green)	May	1, 2, 3
East Gresford (A. R. Brown) ..	,,	10, 11
Trangie (A. K Butter)	,,	15, 16
Wagga (F. H. Croaker)	Aug.	20, 21, 22
Ganmain (C. C. Henderson) ..	Sept.	10, 11
Narandera (J. D. Newth)	Oct.	8, 9

THE dairy heifer is a unit of the potential milking herd. The breeder who knows how to grow and handle dairy heifers will add substantially to his achievement with his dairy herd.

Field Peas for Wheat Farmers.

To What Extent can South Australian Practices be Adopted in New South Wales?

E. S. CLAYTON, H.D.A., Senior Experimentalist.

Wheat farmers in New South Wales have long felt the need of a crop that can be successfully rotated with wheat and oats, but it has been difficult to find one that can be profitably utilised under our special conditions. South Australia has apparently satisfactorily solved the problem, so far as their conditions are concerned, by the growing of field peas, and it only remains for us now to see how far we can modify their practices to suit the conditions existing in New South Wales.

The Position in South Australia.

Field peas have been grown for many years in South Australia, but it is only in recent years that machinery has been invented and improved (chiefly by the farmers) that has made it possible to harvest the grain economically. The pea harvesting attachment has been the main factor in causing a rapid extension of the area devoted to the crop. The following table shows how the area under peas has increased during the last few years:—

Area under Peas in South Australia.

1923-24...	4,700 acres.
1924-25...	9,400 ,,
1925-26...	11,200 ,,
1926-27...	15,500 ,,

Each year has shown a considerable increase in area and the general opinion is that it will continue to expand.

Climatic Requirements.

In South Australia field peas seem to do well in all the best wheat districts. Localities with an annual rainfall of 20 inches or more grow the crop well, but in the drier parts, where the rainfall is as low as 10 and 12 inches, peas are not grown. Good crops of peas were seen growing in districts where the annual rainfall was 17 inches a year, and they are grown in districts of even lower rainfall. The crop is not so hardy nor so drought-resistant as wheat. It prefers a favourable spring so that the pods can fill well.

So far as soil preferences are concerned the crop seems to grow well on any soil that is considered good enough for wheat, but it grows better, of course, on the heavier soils. It seems likely that there is a great area of land in New South Wales that meets these requirements, not only in the tableland districts, but also extending well out on the slopes. In the near future the crop will be thoroughly tested in many districts to find out

where it can be profitably grown. Last year (1928) an excellent crop of field peas was to be seen on Mr. D. Bolte's property at West Wyalong. It was of the Dun variety, and although only 4 inches of rain actually fell on the peas there was every prospect of a 12-bushel yield when the writer inspected the crop prior to harvesting. Mr. Bolte intends to plant a considerable area of field peas this coming season.

Varieties.

Up till the last few years the only variety grown in South Australia was Early Dun, but recently a variety called White Brunswick was introduced from Western Australia and is giving excellent results. Great credit is due to Mr. W. S. Kelly, of Tarlee, South Australia, for popularising White Brunswick in that State. Being an earlier variety than the Dun, it is likely to make pea-growing possible in still drier districts. It also has the advantage of being sufficiently early to avoid most of the damage done by the "pea grub." Last season the Early Dun variety was seriously attacked by this pest, but practically no damage was done to the White Brunswick. Under the most favourable conditions it is likely that the Early Dun, being later maturing and more bulky, would give a heavier yield, but in view of the damage caused by the pea grub it is probable that White Brunswick will replace it to a great extent. The pods of the former are comparatively short, but they fill out well and the quality of the grain is better than that of the Dun. There is, however, a slight tendency for the pods to shatter on ripening, but it may be possible to improve the variety in this respect.

White Brunswick Field Peas on Mr. W. S. Kelly's Property, South Australia.

This crop was sown in June, 1928 at the rate of 90 lb. seed and 1 cwt. superphosphate per acre. The crop was photographed in October, and therefore shows about four month's growth.

The Place of Field Peas in Rotation.

The rotation of fallow, wheat, peas, wheat, is the one generally adopted in South Australian pea districts, but, of course, it is varied to suit individual requirements. The crop of peas following the wheat gives quite good yields and, strange as it may seem, the crop of wheat that follows the peas often yields just as well in good rainfall districts as if the land had been fallowed, and infinitely better than if the crop had been sown on wheat stubble. By

adopting this rotation, three crops are produced in four years, and it is considered that the crop of peas is grown almost without incurring any expense as it is preceded and followed by a wheat crop. The beneficial effect on the following crop of wheat must also be considered.

Peas improve the fertility of the soil to a considerable extent. It seems likely, however, that our rainfall will be too low to permit of a crop of wheat following the pea crop without first fallowing the land. But in certain districts such as the north-west where a short summer fallow gives good results, or in districts where the winter rainfall is sufficient, it may be possible to adopt the rotation of fallow, wheat, peas, wheat. In this matter we will be guided by the results obtained in practice in New South Wales.

Another Crop of White Brunswick Peas.
This crop was grown on stubble on a South Australian wheat farm.

Sowing.

Comparatively large areas of peas are sown by many growers in South Australia. Areas of 100 and 200 acres are not uncommon. Under the rotation system mentioned, on 600 acres of arable land, 150 acres would be fallowed, 300 acres would be under wheat (of which 150 acres would be on fallow and 150 acres after peas) and 150 acres under peas. As soon as the wheat crop preceding the peas is harvested the stubble is burnt and the land scarified or cultivated shallow (2 inches). It is usual not to plough for the pea crop. The land may be again cultivated as required before sowing to produce a satisfactory seed bed. The peas are sown immediately the wheat sowing is completed, generally during June. There is a tendency to sow the peas earlier and the wheat later. If sown too early there is some risk of frost, but if sown too late the hot weather reduces the yield and many men are now more inclined to risk the frost rather than the hot dry weather of early summer. It may be mentioned that the White Brunswick variety is not so easily damaged by frost as is the Dun pea.

The seed is sown with a wheat drill or combine sowing through every drill. It is sown at the rate of about 1½ bushels to the acre, along with superphosphate at 1 cwt. per acre. The harrows usually follow the drill. It is necessary to roll the land if it is intended to harvest the crop for grain so as to allow the harvesting attachment to operate. On friable


PERDRIAU BALLOON

loams the roller may follow the drill, but on heavy soil that will set hard after rain it is necessary to delay rolling until the crop is showing above ground. The culti-packer is frequently used instead of the roller.

Harvesting.

The crop is ready to harvest when the peas in the lower pods are beginning to harden. The header is prepared by removing the ordinary 8-feet wheat attachment and substituting the 6-feet pea harvesting attachment. It is fitted with special false comb, the teeth of which are about 4 inches deep. These can be run on the ground and pick up the crop very satisfactorily.

In most years field peas yield quite well in districts with a sufficient winter rainfall. The general opinion in South Australia seems to be that field peas can be depended upon to yield about the same as wheat except in the dry districts where wheat has the advantage on account of its hardiness. In a district where wheat crops would average 15 bushels, the pea crops would average about 14 bushels. But it must be borne in mind that peas are not as drought-resistant as wheat and will not stand faulty preparation.

Federation Wheat at Waite Research Station, South Australia.]
A four-year rotation of bare fallow, wheat, peas, and oats was being tried out on this plot.

As soon as the pea crop is off sheep are turned into the paddock to clean up the residue, and the land is then immediately cultivated or scarified to a depth of about 2 inches in preparation for the wheat crop. The land must be carefully prepared after peas for the next wheat crop as peas are not a good smothering crop and consequently weeds gain a footing unless the cultivation methods are good. The general practice is to cultivate after the peas, two or three times if necessary, instead of ploughing.

How Peas are Utilised.

Some of the pea crops are used for grazing, which subject will be discussed later, but about 75 per cent. of those grown are harvested for grain and held to be fed to stock later in the autumn. The chief use of the grain is for feeding to sheep. Lambs, or ewes with lambs, are specially catered for by the pea-growers. For feeding a ewe flock prior and subsequent to lambing, peas are excellent. Grain can be scattered out on the ground with

practically no waste, as the sheep pick it up with ease. Lambs are fattened off on a ration of about 1 lb. a day per head, but if they are on good grazing ½ lb. per day will be sufficient. Sheep take readily to the grain as do all stock except horses, which take some time to get accustomed to it, but they eventually show a decided preference for it once the taste is acquired. The grain must be crushed for horses, and 3 or 4 lb. a day can be fed. Pea grain is also used for pigs. When skim milk is scarce, peas are used to provide protein. The grain is also largely used for cows to supplement the grazing. In fact, the grain can be used wherever there exists a necessity for supplying a protein food.

The great bulk of the peas is utilised on the farms where the crop is grown, and, being such a handy and valuable food, growers find it possible to carry more stock, with consequent increased returns from this section of the farm. Then, after the crop has been harvested, the pea stubble generally affords sufficient grazing to fatten two or three sheep to the acre. Moreover, growers who wish to sell portion of their grain find a ready market. For feeding to pigs and cows, a general price of about 5s. a bushel is considered satisfactory, although the price is often lower, while for seed purposes up to 10s. a bushel has been obtained, but of course the price varies.

Grazing Field Peas.

A fair area of the peas grown is grazed off instead of harvested. To do this economically it is advisable to subdivide the crop. The peas are ready to graze as soon as the latest developed pods are filled, but before they are quite ripe. If fed at this stage the sheep also get all the other food in the paddock, such as wild oats, &c. The sheep eat the grain and also eat practically all of the haulm of the peas, so that the paddock is cleaned up thoroughly. Immature peas are not palatable to sheep. It is necessary, therefore, to wait until the crop is almost ripe before turning the sheep in. In the best pea districts in South Australia they find that it is possible to fatten ten to fifteen forward lambs or wethers per acre on the crop in about four or five weeks. Even after this there will still be good grazing left for the ewe flock, which can be left on the paddock until practically nothing remains and it is almost as clean as a fallow.

Should rain fall while sheep are grazing on the crop it is necessary to remove them on account of the danger of dietetic trouble. The sheep, of course, shatter the pods and many grains fall on the ground. Should rain fall these seeds germinate, and if eaten at that stage set up stomach trouble and cause many deaths. After the peas have thoroughly dried up again it is safe to turn the sheep back on to the crop. As long as there is shooting or moulding there will be trouble if sheep are left in the paddock. The surest way to guard against shattering and spoiling of the peas is to prevent the sheep from walking over the crop, and this can be done by subdividing the area prior to feeding off. It is the most economical way to graze a paddock.

Agricultural Bureau Winter Green Fodder Crop Championship.

Lower North Coast.

J. M. PITT, H.D.A., Senior Agricultural Instructor.

MUCH more interest than usual was displayed by members of the Lower North Coast branches of the Agricultural Bureau in this year's winter fodder contest—the third of its kind conducted on the Lower North Coast. Not only is keen competition fostered within each branch, but each competitor is eager to secure the honor of winning the championship trophy, which is subscribed for equally by the branches competing.

Competitors are realising that to produce a "show plot" slipshod methods of cultivation are of no avail, nor will it do to sow any sort of variety. Consequently seed beds are being more thoroughly prepared, more attention is being given to the class of fodder sown, the time of sowing, and the more general use of fertiliser. Journeying through the districts where branches of the Bureau are centred, it is particularly noticeable that greater quantities and better quality fodders are available as compared with a few years back.

The Season.

From early November until June, or even July, the whole district passed through a very wet time. Only for short periods did the land become sufficiently dry to carry out cultural operations, and as these opportunities were, in many instances, not availed of by the farmers, poorly-prepared seed beds or late sowings, or both, were the result. Sowings must be made between the 1st and 21st April for best results, especially with Sunrise, Mulga, and Myall—our three most suitable varieties of oats.

Heavy rain was recorded throughout the early growing period, but apart from flooding a few of the plots no material damage was done. The winter was mostly mild, August being quite spring-like and dry. This unseasonable weather was conducive to the spread of rust, which was prevalent in a more or less severe form, except in a few instances, being most noticeably absent on the better cultivated areas. Mulga was the variety most severely attacked, although Sunrise, Algerian (not now grown in competition plots), and Myall were also badly attacked in isolated cases. It was particularly noticeable, however, that where thorough preparatory cultural operations were not applied rust was the more prevalent. Too much importance cannot be attached to the thorough preparation of the land—the longer the preparation the better, heavier, and cleaner the crop.

The Crops.

Sunrise is the most popular variety used, either alone or in combination with Gresley wheat (a variety with tough, leafy stems, maturing about the same time as Sunrise) and peas and vetches. This combination, especially

where available in the desirable quantities or proportions, is usually allotted the most points under the "Suitability of crop for fodder" heading. Mulga has given very satisfactory results also, but seems very subject to rust. Myall, too, was good here and there. Buddah, a comparatively new variety, shows distinct promise, being earlier than the abovementioned varieties and a heavy yielder. Canberra, in lieu of Gresley in one plot, showed promise, maturing a little ahead of Gresley—it will probably be useful for coming in with Buddah.

After a very promising start the legumes (vetches especially) faded away under the influence of a dry spring and the heavier cereal growth. The French Grey field pea is proving more suitable than the better known Grey field pea for inclusion in the competition plots. French Grey is an upright grower and matures earlier than the latter, and when more seed becomes available it will, no doubt, eventually supersede the old Grey variety.

Mr. B. Richardson's Crop of Sunrise Oats, Gresley Wheat, Field Peas, and Vetches.

In a majority of the plots there was rather too much wheat grown, Instead of half oats and half wheat, as adopted at present by many growers, it might be advisable to sow three parts of oats to one part of wheat with peas and vetches.

Fertiliser undoubtedly gave the farmer a heavier yield and a better class of fodder.

Dumaresq Island Competition.

Several competitors withdrew before judging time (end of August), six plots remaining.

Cultural operations were mostly good, the number of ploughings ranging between three and six, the first dating from five to three months before sowing. Early ploughing ensures a thorough mellowing of the soil, conservation of moisture, and a fine seed bed, all of which factors are essential to secure the best results.

The sowings were mostly late, extending from 25th April to 30th May. This was due entirely to the wet late summer and early autumn preventing

access to the land. Sowings should not be later than the third week in April, nor is it advisable to sow earlier than the 25th March (approximately), owing to the possibility of the oats heading prematurely.

Fertiliser was almost universally applied. As the Dumaresq Island contest is also run in conjunction with a competition for a trophy donated by the late Chilian Nitrate Company, fertilising with superphosphate and nitrate of soda is compulsory to secure points for the trophy. Consequently, with the exception of Mr. B. Richardson's plot, which was sown on new land, all were fertilised—and it is unwise not to use fertiliser in conjunction with good cultural methods nowadays.

Seeding ranged from very heavy sowings (over 2 bushels of the cereal) on Mr. Richardson's property to medium on the other farms.

With the exception of Mr. McLennan's plot, which was without wheat, the others were sown to the combination mixture of oats, wheat, peas, and vetches. Except in the case of one of Mr. Dorward's plots, on which the cereal had been sown thin, the legumes mostly faded out. Mr. Richardson's plot scored well for yield, succulence, and freedom from disease. It, however, like the majority of the Dumaresq Island plots, was seen to disadvantage, being considerably lodged by a heavy gale which was raging at time of judging. It lost points chiefly through being immature, and because of appearance, but nevertheless won the local contest.

Mr. Dorward's No. 2 plot, which secured second place, scored well as regards crop combination, and was a nice plot otherwise, but the yield was light.

Mr. Mooney's No. 2 plot lost chiefly on account of appearance, prevalence of rust, and also to a less extent under other headings. Budgery, on his No. 2 plot, showed promise in its first trial on the coast.

Mr. McLennan's plot was light, badly rusted, and lacked succulence.

RESULTS of Dumaresq Island Competition.

Competitor.	Crop.	Suitability of crop for Fodder.	Leafiness and Succulence.	Period of Maturity.	General Appearance.	Freedom from Rust and other Diseases.	Yield—(2 points per ton).	Total.
	Maximum Points	30	15	15	15	10	...	...
		Points	Points	Points	Points	Points	Points	Points
B. Richardson ...	Sunrise oats, Gresley wheat, field peas, and vetches.	23	14	7	9	9	36	98
D. Dorward, No. 2 ...	Sunrise oats, Canberra wheat, field peas, and vetches.	27	12	12	12	8	25	96
J. P. Mooney, No. 2	Sunrise oats, Gresley wheat, French Grey field peas, and vetches.	25	11	11	8	6	34	95
J. P. Mooney, No. 1	Budgery oats, Grey field peas, and vetches.	24	11	12	9	7	30	93
D. Dorward, No. 1 ...	Sunrise oats, Canberra and Gresley wheat, and peas.	23	10	11	11	6	32	93
K. McLennan ...	Mulga oats, peas, and vetches	21	8	13	12	4	21	79

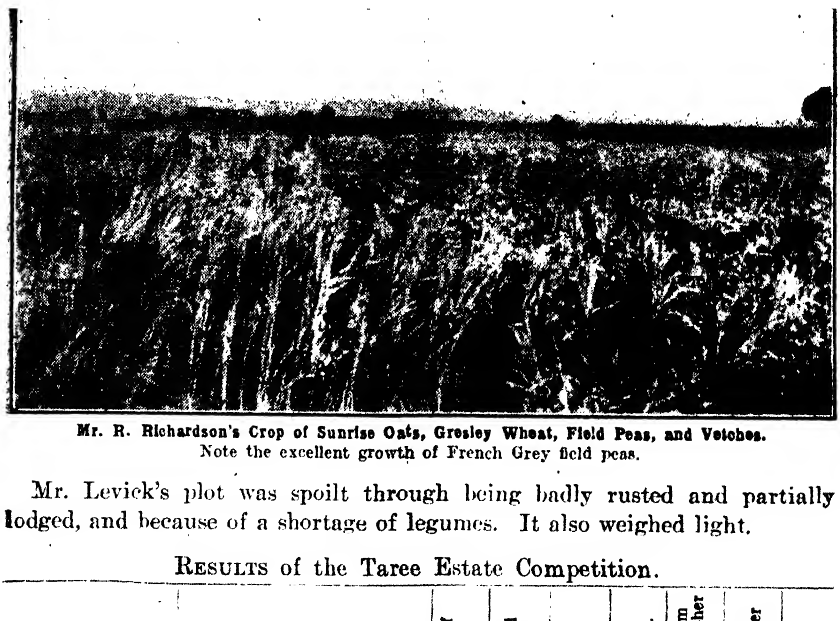
Taree Estate Competition.

Five plots remained in the contest for the final judging, a number being withdrawn for various reasons, chiefly because of being sown too late. With

one exception the preparatory cultivation for the plots was satisfactory, the majority of first ploughings taking place prior to the new year, followed by further workings, when possible, up to sowing time. Plantings were mostly late, ranging between mid-April and mid-May, delay being caused by wet conditions.

Messrs. Richardson, Levick, and Macdonald sowed the usual mixtures of wheat, oats, peas, and vetches; Mr. Allen's plot was mostly wheat. Messrs. Richardson and Macdonald did not use fertiliser, its absence causing both plots, Mr. Richardson's especially, to lose points under "Succulence," "Freedom from Rust," and "Yield." Both his plots were well supplied with legumes, but did not weigh as well as anticipated. Mr. Macdonald's plot was also well supplied with peas, but weighed light.

Mr. Allan's plot of Thew wheat lost considerably on account of no other crop being grown with it. There was also a lack of leafiness, and it did not weigh well, otherwise the plot was a very fine one.



Mr. R. Richardson's Crop of Sunrise Oats, Gresley Wheat, Field Peas, and Vetches.
Note the excellent growth of French Grey field peas.

Mr. Levick's plot was spoilt through being badly rusted and partially lodged, and because of a shortage of legumes. It also weighed light.

RESULTS of the Taree Estate Competition.

Competitor.	Crop.	Suitability of crop for Fodder.	Leafiness and Succulence.	Period of Maturity.	General Appearance.	Freedom from Rust and other Diseases.	Yield— (2 points per ton.	Total.
	Maximum Points	30	15	15	15	10	...	...
		Points.	Points	Points	Points	Points	Points	Points
R. Richardson, No. 1	Sunrise oats, Gresley wheat, field peas, and vetches.	27	13	11	11	8	28	98
R. Richardson, No. 2	Mulga oats, Gresley wheat, field peas, and vetches.	28	12	11	12	7½	27	97½
G. Levick	Sunrise oats, Gresley wheat, field peas, and vetches.	24	13	14	10	5	26	92
W. T. Macdonald ...	Sunrise oats, Gresley wheat, field peas, and vetches.	28	11	14	12	6	16	87
P. Allen	Thew wheat and field peas ...	19	9	14	14	8	23	87

Fosterton Competition.

Although one of the youngest branches of the Bureau in the contest, and far from strong numerically, there is no lack of enthusiasm at Fosterton in any project that aims at the production of more and better fodders. The soils, in extent and fertility, fall behind those of the bigger rivers farther north, consequently it was no mean performance on the part of Messrs. Bosworth Bros. to secure championship honors in the winter fodder crop competition at their second attempt. Their success was due entirely to their enthusiasm—old methods of fodder production were scrapped and the more up-to-date ideas introduced, the soil was given long and frequent preparation, fertiliser was used, and the best crop mixtures were sown as near as possible to the right time. The plot they entered was well balanced, scoring well under all headings, and yielding 15 tons to the acre. It was one of the few Mulga plots free from rust, and this was probably due to good cultural

Messrs. Bosworth Bros.' Champion Crop of Mulga Oats, Florence Wheat, Field Peas, and Vetches.

methods, fertiliser, and climatic conditions—the winter being colder there than farther north. The previous crop was winter fodders. The plot was disc harrowed in January; double disc harrowed, rolled, and harrowed. Disc harrowed in February and March, then harrowed. Mouldboard ploughed after rain in April. Sown on 27th April, 1928, when the seed was springtoothed in and harrowed. Peas and vetches were sown in drills 2 ft. 3 in. apart through the crop. Bone dust and superphosphate at the rate of 194 lb. per acre had been previously applied.

Their second plot, in which Sunrise oats was included, was also very good, being a shade lighter.

Mr. A. R. Lean also thoroughly prepared his plot. The soil here seemed heavier than on Bosworth Bros' property. The previous crop was oats, sown in 1926; fallowed 1927; ploughed September, 1927; disc harrowed in December;

ploughed end of January; disc harrowed in February and end of March; ploughed again in April; harrowed and sown 24th April. The crop mixture was fairly good, although on the thin side, and Clarendon wheat matured rather too early for the oats. Superphosphate (½ bag) and sulphate of ammonia (1½ bags) applied per acre. Rust was prevalent, and the yield was light.

Mr. R. Lean sowed his plot on second-class ridge soil; broken up first week in December; ploughed again in January, followed by another ploughing in April; then harrowed; sown 3rd May, 1928. Superphosphate was applied before sowing, and a top-dressing was given with nitrate of soda. The heavy autumn rainfall was detrimental to this class of soil, the land becoming waterlogged. Rust was prevalent in a severe form, which affected the leafiness and succulence.

Messrs. Lean Bros.' plot, also on rather heavy river flat soil, was sown too late to have much chance. After the previous maize crop the paddock, containing heavy weed growth, was disc harrowed several times; a disc ploughing was then given, the soil being on the damp side. Superphosphate (100 lb.), sulphate of ammonia (40 lb.), and sulphate of potash (20 lb.) were applied, and the effect of the fertiliser was very noticeable in the quality of the fodder produced. The crop mixture of peas and vetches was also good, but the crop was very immature.

RESULTS of the Fosterton Competition.

Competitor.	Crop.	Suitability of crop for Fodder.	Leafiness and Succulence.	Period of Maturity.	General Appearance.	Freedom from Rust and other Diseases.	Yield—(2 points per ton.	Total.
	Maximum Points	30	15	15	15	10	...	...
		Points	Points	Points	Points	Points	Points	Points
Bosworth Bros., No. 1	Mulga oats, Florence wheat, field peas, and vetches.	26	14	12	14	9	27	102
Bosworth Bros., No. 2	Sunrise oats, Gresley wheat, field peas, and vetches.	25	13	13	14	9	30	104
A. R. Lean	Sunrise oats, Clarendon wheat, field peas, and vetches.	24	10	12	13	7½	22	88½
Lean Bros.	Sunrise oats, Florence wheat, field peas, and vetches.	27	14	7	11	9½	12	80½
R. Lean	Sunrise oats	20	7	9	9	5	17	67

Bandon Grove Competition.

Only one competitor's (Messrs. Alex. Smith and Sons) plot was judged at Bandon Grove, the others being withdrawn for various reasons—mainly because of late sowing and immaturity. This farm has been outstanding in fodder production now for many years. Mr. Smith is a firm believer in sound and progressive ideas, with the result that his fields always look well, and feed is usually in abundance and of the best quality. Although finishing close up each year (probably showing a higher average over the three years than any other competitor), his turn is still to come as a trophy winner.

This year's plot was a very good one, but short of legumes, showing some rust, and just a little wanting under other headings. The land had lain in fallow since October, when it was ploughed. After November it was cultivated several times, no additional ploughing being given. It was sown on 16th April. Fertiliser was applied.

Other plots seen were those of Mr. Heggarty, a fairly good plot, but insufficient in area; and both of Mr. Dowling's plots were sown to oats and legume. In regard to the others, the cultural methods adopted were not satisfactory. No doubt the wet season influenced matters in this connection, although insufficient cultivation and neglect of early ploughing are rather too common in this area. Moreover, the varieties used are not of the best,

Messrs. Alex. Smith & Sons' Crop of Sunrise Oats, Gresley Wheat, Field Peas, and Vetches.

too much Algerian is sown, and legumes are not introduced in sufficient quantities. Messrs. Smith and Sons' lead in this respect might well be followed.

RESULT of Bandon Grove Competition.

Competitor.	Crop.	Suitability of crop for Fodder.	Leafiness and Succulence.	Period of Maturity.	General Appearance.	Freedom from Rust and other Diseases.	Yield (2 points per ton).		Total.
	Maximum points ...	30	15	15	15	10			
		Points.	Points.	Points.	Points.	Points.	Points.	Points.	Pts.
Messrs. Alex Smith & Sons.	Sunrise oats, Gresley wheat, field peas, and vetches.	24	12	13	12	7	15	30	98

Temagog–Turner's Flat Competition.

This is another newly-formed Bureau branch composed of a handful of enthusiastic farmers. Some of the land owned by the competitors here is

very rich. Two very fine plots were inspected, that entered by Mr. E. H. Ducat being worthy of particular mention. Soil, alluvial loam. After the removal of the maize crop in March two ploughings were given; no fertiliser was applied, the farmer considering the flood deposit left by the February floods to be sufficient for this year. Had the plot been sown earlier and contained a larger proportion of legume and wheat it would have been very hard to beat. As it was, it scored 102 points, and tied for the second heaviest plot in the contest with a yield of 17 tons.

Mr. Booth's plot was not quite as good, being sown after maize and after one ploughing. No fertiliser was used, nor had the flood reached this area. The plot contained no wheat, and was badly rusted. It was not so succulent as Mr. Ducat's, and yielded 2 tons less.

RESULT of Temagog-Turner's Flat Competition.

Competitor.	Crop.	Suitability of crop for Fodder.	Leafiness and Succulence.	Period of Maturity.	General Appearance.	Freedom from Rust and other Diseases.	Yield—(2 points per ton.	Total.
	Maximum Points	30	15	15	15	10	...	...
		Points	Points	Points	Points	Points	Points	Points
Mr. E. H. Ducat ...	Sunrise oats, field peas and vetches.	23	14	10	12	9	34	102
Mr. J. W. Booth ...	Myall oats and field peas ...	22	11	12	11	6	30	92

The Lower North Coast Championship.

The winners in the foregoing competitions were eligible to compete for the district championship. The trophy was won by Messrs. Bosworth Bros., Fosterton, and the following table shows the placings:—

CHAMPIONSHIP Awards.

Competitor.	Crop.	Suitability of crop for Fodder.	Leafiness and Succulence.	Period of Maturity.	General Appearance.	Freedom from Rust and other Diseases.	Yield—(2 points per ton).	Total.
	Maximum Points	30	15	15	15	10	...	...
Bosworth Bros., Fosterton.	Mulga oats, Florence wheat, field peas, and vetches.	25	13	13	14	9	30	104
E. H. Ducat, Temagog-Turner's Flat.	Sunrise oats, field peas, and vetches.	23	14	10	12	9	34	102
R. Richardson, Taree Estate.	Sunrise oats, Gresley wheat, French Grey field peas, and vetches.	27	13	11	11	8	28	98
Alex Smith & Sons, Bandon Grove.	Sunrise oats, Gresley wheat, field peas, and vetches.	24	12	13	12	7	30	98
B. Richardson, Dumaresq Island.	Sunrise oats, Gresley Wheat, field peas and vetches.	23	14	7	9	9	36	98

Cabbage and Cauliflower Trials, 1928.

J. DOUGLASS, H.D.A., H.D.D., Agricultural Instructor.

THE past season has been one of the most successful for cabbage and cauliflower growing experienced in the coastal districts for some years. The growing period was marked by an even temperature and rainfall and generally excellent conditions; although the rainfall was good, sufficient fine weather was experienced in which to clean and cultivate the crops. The comparative absence of weeds accounted in some degree for the marked absence of cabbage moth. In some localities the heavy July rains were responsible for a certain amount of blackleg and other diseases associated with crucifera. Prices were good during June and July, although famine prices were not reached. The market fell during August, largely owing to the excellent cauliflower crops on hand.

Enkhuizen Glory Cabbage.

Variety trials with cabbages and cauliflowers were conducted in many of the coastal areas, particularly around the Hunter, Hawkesbury and Metropolitan districts. Figures illustrating the results of these trials were difficult to obtain, mainly owing to the mixed nature of the commercial seed, varieties cutting over a longer period than normally. Much information as to the comparative yields and suitability of the varieties to local and market conditions was nevertheless obtained.

Cabbages.

The varieties of cabbages included in the trials were Succession, Clarendon Ball Head, Utility, Copenhagen Market, Round Head, Winningstadt, Short Stem Drumhead, Enkhuizen Glory, and Golden Acre.

Generally speaking, farmers realise that an early variety of cabbage yields a more certain profit than late varieties, which, taking longer to mature, occupy the ground longer, and are subject to greater risk of damage from cabbage moth, disease, and seasonal conditions. It is at the same time realised that a late variety produces a larger cabbage than early varieties. A study of the present-day market requirements, however, shows that the call is for

Stage of Growth at which to Top-dress.

A cabbage, showing stage of growth at which to apply a top-dressing of 1 cwt. sulphate of ammonia.

a medium-sized cabbage of high quality—the demand for large cabbages is not as great as in previous years. Growers should therefore realise that by the use of more suitable early varieties, coupled with the adoption of better cultural methods and the use of fertilisers, more money will be made. The tests carried out have given a good indication of the types to be grown. The four outstanding early varieties were Enkhuizen Glory, Golden Acre, Copenhagen Market, and Round Head. These four varieties are very similar in many characteristics, and have all given excellent results. In the large cabbage-growing districts on the Hunter and Hawkesbury rivers Enkhuizen Glory has given good results for the past four seasons, and can be definitely recommended as the early variety to grow. Succession and

Short Stem Drumhead were the best of the late varieties, both producing exceptionally large cabbages. It is found, however, that both these varieties have a slight tendency to "give back" or wilt within a day or two of cutting. This tendency is absent in Enkhuizen Glory. This variety produces an exceptionally heavy cabbage, although of only medium size. Another feature worth noting is that it can be planted much closer in the rows than the late sorts, and thus produces a greater number of heads per acre.

RETURNS obtained by Mr. J. C. Kershaw, Macquarie Fields.

Variety.	Numbers cut before 30th July.	Average price over period.		Return over period.		Number cut between 30th July and 30th Aug.	Average price over period.		Return over period.		Number cut after 30th August.	Average price over period.		Return over period.		Total Return.		
	doz.	s.	d.	s.	d.	doz.	s.	d.	s.	d.	doz.	s.	d.	s.	d.	£	s.	d.
Enkhuizen Glory	9	12	0	108	0	12	9	0	108	0	3	9	0	27	0	12	3	0
Copenhagen Market.	10	12	0	120	0	14	9	0	126	0	...	...		...		12	6	0
Round Head ...	8	7	0	56	0	13	5	0	65	0	3	5	0	15	0	6	16	0
Succession ...	3	12	0	36	0	4	9	0	36	0	17	9	0	153	0	11	5	0
Short Stem Drumhead.	4	12	0	48	0	12	9	0	108	0	8	9	0	72	0	11	8	0
Utility	0	...		...		3	7	0	21	0	21	9	0	189	0	10	10	0
Clarendon Ball Head.	7	7	0	49	0	14	5	0	75	0	3	5	0	15	0	6	19	0
Winningstadt ...	8	5	0	40	0	12	3	6	42	0	4	3	6	14	0	4	16	0

Cauliflowers.

The varieties of cauliflowers included in the trials were Veitch's Autumn Giant, Early Phenomenal, Late Phenomenal, Late Metropole, Clarendon Early Mammoth, Maitland Market, Early Snow White, Five Months Special Giant, and Six Months Special Giant.

Although the coastal districts of New South Wales are not climatically ideal for the production of cauliflowers, large areas are devoted to this crop each year. In districts where intense methods of agriculture are not studied, or where irrigation is neglected, cauliflowers are looked on as the most uncertain of crops. On the other hand, certain growers situated in the poorest country in the Sydney suburbs have grown cauliflowers successfully for many years. Although the coast is not particularly suited to the crop, cauliflowers can be grown successfully if up-to-date methods are employed. Growers should cultivate suitable varieties and aim at obtaining the best growth throughout. The growth can be governed by (1) cultivation (both before and after planting and irrigation), (2) manuring, (3) irrigation, and (4) control of insect pests and disease.

The correct variety to grow can only be ascertained by experience, or as the result of departmental or private experiments. Of the varieties mentioned above, Five Months Special Giant and Six Months Special Giant are both local productions; two unnamed local selections were also tried. The experiments indicated that the local seed gave the best results under all conditions. Several of the varieties failed to produce a marketable number of cauliflowers.

A Curly-leaf Borecole Cabbage.
This was found as an impurity in a crop of Succession variety.

Early Snow White (an early variety, as the name implies, and with a well protected compact head of high quality) yielded exceptionally well in some of the tableland districts. At Cardiff Six Months Special Giant produced a record crop. A survey of the results of all trials showed that Six Months Special Giant produced the most payable crops under all conditions. Early Snow White was the best of the early varieties, and Late Phenomenal the best of the late maturing varieties.

Infectious Diseases Reported in December.

The following outbreaks of the more important infectious diseases were reported during the month of December, 1928:—

Anthrax	3
Blackleg	Nil.
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia contagiosa	15
Swine fever	Nil.
Contagious pneumonia	3

—Max Henry, Chief Veterinary Surgeon.

TUBERCLE-FREE HERDS.

OF the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number tested.	Expiry date of this Certification.
Mr. Stanton, Leicester Park, Mittagong ...	63	6 Feb., 1929
A. E. Collins, Hazelhurst Dairy, Bowral ...	13	8 " 1929
Department of Education, Yanco Agricultural High School ...	34	12 " 1929
New England Girls' Grammar School, Armidale ...	17	12 " 1929
A. V. Chaffey, "Lilydale," Glen Innes ...	16	14 " 1929
Lunacy Department, Kenmore Mental Hospital ...	99	17 " 1929
Tudor House School, Moss Vale ...	6	22 " 1929
Lunacy Department, Orange Mental Hospital ...	3	22 " 1929
William Thompson Masonic School, Baulkham Hills ...	29	23 " 1929
Australian Missionary College, Cooranbong ...	57	24 " 1929
Lunacy Department, Rydalmere Mental Hospital ...	63	25 " 1929
Department of Education, Hurlstone Agricultural High School ...	33	1 Mar., 1929
J. F. Chaffey, Glen Innes (Ayrshires) ...	58	2 May, 1929
F. W. Hopley, Leeton ...	25	14 " 1929
P. F. Mooney, Calala ...	33	16 " 1929
Department of Education, Gosford Farm Homes ...	16	16 " 1929
Lunacy Department, Parramatta Mental Hospital ...	93	6 June, 1929
E. P. Perry, Nundorah, Parkville (Guernseys) ...	26	12 " 1929
Dominican Convent, Moss Vale ...	4	26 " 1929
Sacred Heart Convent, Bowral ...	10	21 July, 1929
St. Patrick's College, Goulburn ...	8	26 " 1929
Presbyterian Ladies College, Goulburn ...	4	26 " 1929
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys) ...	42	9 Aug., 1929
Kyong School, Moss Vale ...	2	21 " 1929
Department of Education, Mittagong Farm Homes ...	34	23 " 1929
Blessed Chanel's Seminary, Mittagong ...	4	25 " 1929
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys) ...	75	25 " 1929
Walaroi College, Orange ...	5	30 " 1929
Riverstone Meat Co., Riverstone Meat Works, Riverstone ...	127	5 Sept., 1929
J. L. W. Barton, Wallerawang ...	22	11 Oct., 1929
Department of Education, Eastwood Home ...	9	5 Dec., 1929
Lunacy Department, Morisset Mental Hospital ...	21	7 " 1929
J. Davies, Puen Buen, Scone (Jerseys) ...	39	12 " 1929
Kinross Bros., Minnamurra, Inverell (Guernseys) ...	73	14 " 1929
Lunacy Department, Callan Park Mental Hospital ...	21	19 " 1929
Miss Brennan, Arrankamp, Bowral ...	14	20 " 1929
A. Shaw, Barrington ...	36	11 Jan., 1930

—MAX HENRY, Chief Veterinary Surgeon.

THE IMPORTANCE OF TOP-DRESSING PASTURES.

ATTENTION has been paid by agriculturists in the past to the manurial requirements of soils mainly with a view to determining the most efficient and economical methods of supplying plant foods to the soil in order to increase crop production and maintain soil fertility. Recent research, however, has indicated that our previous views on this subject have been too limited and that manuring should be regarded not only in the light of its power of increasing crop production, but also in the light of the fact that profitable stock rearing is closely related to the chemical composition of the soil, in that vegetation to some extent reflects in its mineral composition the soil on which it is grown. This point is of particular importance in the case of grassland for the reason that grass without any supplements frequently forms the sole food supply of the animal.—A. D. HUSBAND, Chief Chemist, Rhodesia Department of Agriculture.

Pure Seed.

GROWERS RECOMMENDED BY THE DEPARTMENT.

THE Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36A, G.P.O., Sydney, not later than the 12th of the month.

Wheat—

Aussie	J. Parslow, Balladoran.
Canberra	J. Parslow. Balladoran.
	E. J. Johnson, Wongalea.
	B. J. Stocks, Cunningar.
	W. W. Watson, Tichborne.
	Manager, Experiment Farm, Condobolin.
	W. G. Law, Thistledown, Gilgandra.
	A. D. Dunkley, Terra Bella, *via* Geurie.
	T. R. Jones, Birdwood, Forbes.
Clarendon	F. C. Anderson, Swan Vale.
Federation	W. Glenn, Thyra Road, Moama.
	H. J. Harvey, Dubbo.
	E. J. Johnson, Wongalea.
	B. J. Stocks, Cunningar.
	W. W. Watson, Tichborne.
	A. D. Dunkley, Terra Bella, *via* Geurie.
	W. G. Law, Thistledown, Gilgandra.
Gresley...	A. D. Dunkley, Terra Bella, *via* Geurie.
Marshall's No. 3	W. Wolter, Ryan, *via* Henty.
	B. J. Stocks, Cunningar.
Merredin	T. W. O'Brien, Junee Reefs.
Nabawa	Cullen Brothers, Dubbo.
	H. J. Harvey, Dubbo.
	T. W. O'Brien, Junee Reefs.
	Quirk and Everett, Wellington.
	J. Dillon, Tullibigeal.
	J. Carruthers, Armatree.
	W. G. Law, Thistledown, Gilgandra.
Queen Fan	F. C. Anderson, Swan Vale.
Riverina	Cullen Brothers, Dubbo.
	W. G. Law, Thistledown, Gilgandra.
Turvey...	B. J. Stocks, Cunningar.
	W. W. Watson, Tichborne.
	W. G. Law, Thistledown, Gilgandra.
Union	W. Glenn, Thyra Road, Moama.

Wheat—continued.	
Wandilla	H. J. Harvey, Dubbo.
	Quirk and Everett, Wellington.
Waratah	R. O. Stiles, Narromine.
	E. J. Johnson, Wongalea.
	T. W. O'Brien, Junee Reefs.
	B. J. Stocks, Cunningar.
	G. T. Troy, Bland, via Quandialla.
	Wallder Brothers, Tullibigeal.
	W. W. Watson, Tichborne.
	Manager, Experiment Farm, Condobolin.
	F. C. Anderson, Swan Vale.
	W. Wolter, Ryan, *via* Henty.
	G. R. B. Williams, Illabo.
	T. R. Jones, Forbes.
Yandilla King...	R. O. Stiles, Narromine.
	H. J. Harvey, Dubbo.
	B. J. Stocks, Cunningar.
	Quirk and Everett, Wellington.
	W. Wolter, Ryan, *via* Henty.
	G. R. B. Williams, Illabo.
	A. D. Dunkley, Terra Bella, *via* Geurie.
Oats—	
Algerian	C. Bennett, Forbes Road, Cowra.
	T. W. O'Brien, Junee Reefs.
	G. R. B. Williams, Illabo.
Belar	C. Bennett, Forbes Road, Cowra.
Mulga	C. Bennett, Forbes Road, Cowra.
	A. P. Unger, Alectown.
Japanese Millet	Manager, Experiment Farm, Coonamble.
Sudan Grass	C. Bennett, Forbes Road, Cowra.
Sweet Sorghums—	
White African	Under-Secretary, Department of Agriculture,
Saccaline	D. P. Shearer and Sons, Glendon, Scott's Flat, Singleton.
Collier	Manager, Experiment Farm, Grafton.
Cowper (late Selection No. 61)	Manager, Experiment Farm, Grafton.
Tomatoes—	
Sunnybrook Earliana	A. E. Johnson, Green Valley, via Liverpool.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

An Argument in Favour of the Silo.

In the course of an address on fodder conservation, the Director of Agriculture (Mr. A. H. E. McDonald), pointed out to North Coast farmers who were present at the recent Murwillumbah Agricultural Bureau Conference, that crops could not always be grown so as to yield just at the time when other feed was scarce. With a silo, however, the farmer could grow his crops at the time of the year when they yielded their heaviest, and the material could be conserved when in its best and most succulent condition until it was needed. The carrying capacity of the farm could, therefore, be increased in the summer with the confidence that the stock would be kept in good condition during the winter, ready to respond at once to the improvement of the grass in the spring.

Poultry Notes.

February.

E. HADLINGTON, Poultry Expert.

Inquiries are frequently received as to the class of houses best suited for layers, and, as there is more spare time on most farms in the next month or so than during the rest of the year, the question of additional accommodation will now be receiving consideration. The time is therefore opportune to deal with the matter of housing layers. The information will also meet the requirements of beginners who are building up their farms.

There are a number of factors to be taken into consideration in erecting such buildings, as, for instance, the amount of capital available, the class of materials to be used, the area of land, &c. If expenditure has not to be strictly limited and if it is desired to provide the best type of house, there is nothing better for general adoption or more suitable for our conditions than the semi-intensive type, which provides for keeping the birds confined during unfavourable weather, and allowing them reasonable yard room when the weather is good. This, of course, necessitates a large house, half of which is utilised for roosting and half for scratching litter, and consequently is somewhat costly to build. If funds do not permit of erecting this type of house, the best course is to build a roosting house which can be added to any time it is desired to change over to the semi-intensive system. A suitable class of house for this purpose is a narrow building with two or three perches and nesting accommodation. For such a house a large run is necessary.

In cases where the area of land is limited and does not allow sufficient space for either of the abovementioned types of houses and runs, the intensive system might be adopted for layers only, but not for housing birds that are required for breeders. In this type of house, as the birds are kept confined permanently, more space has to be allowed and the cost of housing a given number of birds is considerably higher than in the case of the other classes of houses mentioned.

Materials for Constructing Poultry Houses.

There is much diversity of opinion regarding the best materials for building poultry houses; but the materials chiefly used are wood, iron, or fibro-cement sheeting. Having regard to economy in construction and to coolness in the summer and warmth in the winter, sawn hardwood palings are undoubtedly the best material for walls, and iron is the most satisfactory for roofs. With palings, very little studding is required, whereas with iron or fibro a well-supported frame is essential for strength. If iron or fibro is used on account of its being easier to fix, it is desirable to leave a larger aperture along the

back of the house than in cases where wood is used. This makes it cooler in the summer, and if necessary portion of the aperture can be closed in the winter.

Iron or fibro is preferred by some on account of not harbouring vermin to the same extent as wood, but where reasonable care is exercised this factor is scarcely a consideration.

Having described briefly the three systems of housing layers, the following details are given regarding the construction of each type of house.

Semi-intensive Houses.

As previously stated, the idea of the semi-intensive system is to have a house large enough to permit of utilising about half for scratching litter, preferably the front half, and the back portion for roosting. A common mistake observed in the erection of these types of houses is to make them too narrow, which results in either a too restricted scratching area or in placing the perches too close together. On the other hand, some are seen which are too wide, and consequently the roosting portion is not as airy as it should be. It is not advisable either to have a house less in length than one and a half times its width, or to build extremely long houses. One frequently sees houses up to 100 feet in length, divided into four or five compartments with runs only the width of each compartment. This

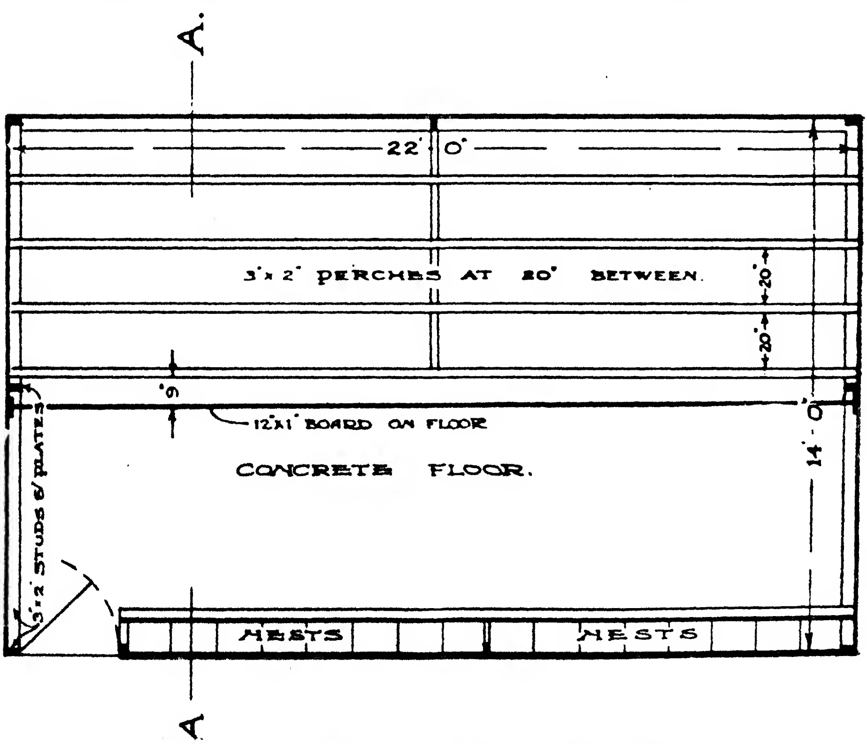


Fig. 1A.—Ground Plan of Single Semi-intensive Poultry House.

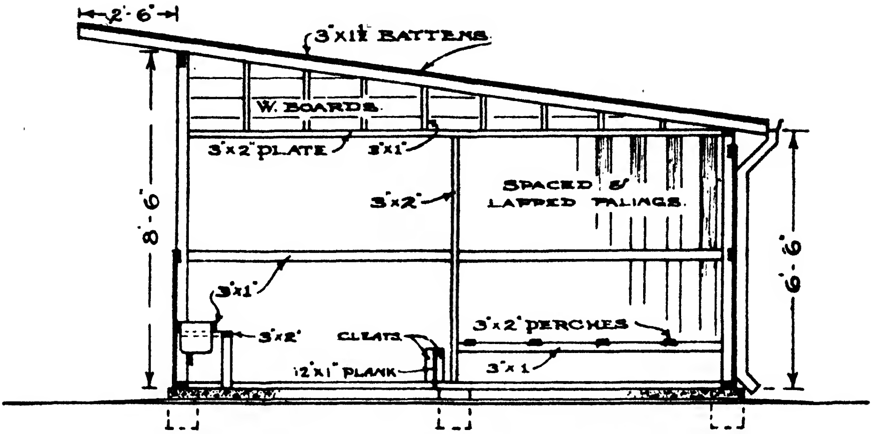


Fig. 1B.—Section AA of Single Semi-Intensive Poultry House.

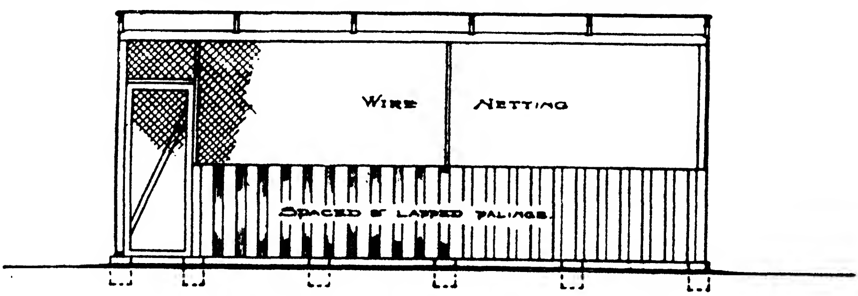


Fig. 1C.—Front Elevation of Single Semi-Intensive Poultry House.

results in the birds crowding in front of the house, and in wet weather the ground becomes a quagmire, while in dry weather it is always dirty. As a guide it may be laid down that the minimum width of a semi-intensive house should be 14 feet and the length approximately 22 feet, which allows 2 square feet of floor space per bird. Such a house is illustrated in Fig. 1, A, B, and C. It is preferable to allow another foot or two in the width, unless economy in construction has to be strictly observed.

The length of one compartment should not exceed 30 feet, but there is no objection to building a double house with a wooden division, or even one with three compartments, provided the runs can be extended out beyond the ends of the building. A suitable measurement for the run of a single house (22 feet long by 14 feet wide) is 1 chain wide by 2 chains long. Such a house will accommodate 150 layers, and a run of the size stated gives approximately 60 square feet for each bird.

Materials for Semi-intensive House.

Dimensions:—

Length	22 feet.
Width	14 feet.
Height (front)	8 feet 6 inches.
Height (back)	6 feet 6 inches.

MATERIALS FOR SEMI-INTENSIVE HOUSE—*continued.*

3″ x 2″ H.W. 2/23′, 2/14′, for bottom plates.
3″ x 2″ H.W. 4/22′, for roosts.
3″ x 2″ Oregon 2/23′, 2/14′, for top and end plates.
3″ x 2″ Oregon 3/13′, 2/17′, for end, back and front studs.
4″ x 2″ Oregon 6/18′, for rafters.
3″ x 1″ Oregon 7/23′, for roof battens.
3″ x 1″ Oregon 2/14′, 4/20′, 2/22′, for end and back rails, and nest supports.
3″ x 1″ Oregon 3/22′, for roost supports and nailing W.B. to, &c.
12″ x 1″ Oregon 1/22′, for dividing scratching material.
Baltic weatherboards 5/14′, for filling over palings at ends.
H.W. sawn palings 6′ (88), for back.
H.W. sawn palings 7′ (160), for ends and cut for front.
3″ x 1″ Oregon 1/13′, 1/7′ 6″, for wire door 6′ 6″ x 2′ 6″ covered with 1″ mesh netting.
6″ x 1″ T. & G. Oregon 4/14′, for ledge door.
Corrugated iron, 26 gauge, 24/9′, for roof.
4″ qr. round guttering, 4 lengths } for guttering.
½ doz. brackets to suit ... } for guttering.
1 length 2½″ downpipe } for roof.
Galvanised screws 7 lb. (1¾″) } for roof.
Lead washers 7 lb. ... } for roof.
D.H. nails 1¾ x 11G (7 lb.) } for general use.
D.H. nails 2½ x 11G. (7 lb.) } for general use.
D.H. nails 1 x 16 (1 lb.), for nailing netting.
"T" hinges, 2 prs. 14″, for door.
Wire netting 22′ x 48″ x 1″ x 18 gauge, for front of house.
Cement, 5 bags, for floor.
Ashes, 1 ton, for concrete and filling.
1 water trough 22″ long, 12″ wide, 8″ deep, made of 26 gauge galv. iron, wired on the edges.
1 Ball cock ½″, for water trough.
1 H.P. cock ½″, for water trough to cut off supply.

These houses should face the north and the runs are best placed on the northern side. By doing this the house forms a breakwind in windy weather, whereas, if the run is on the southern side, the birds will remain in the houses during windy weather. The floors of the houses should be of concrete and laid level. If not level, the scratching litter will drift to the lowest point, leaving part of the floor bare. At all times, several inches deep of scratching litter, such as straw, dry grass, or other material, which is not too dusty, should be kept in the scratching section of the house. The object of the system, which is to give the birds their evening feed in the litter and thus keep them busy, is defeated if sufficient scratching material is not kept in the houses.

A 12 inch x 1 inch board, running the full length of the house, divides the scratching litter from the roosting portion. The perches should be spaced at least 20 inches apart and run the length of the building, but, if possible, 24 inches between each perch is preferable. The nests can be fixed as shown in Fig. 1, A and B, or, if desired, can be placed on the outside with a sloping cover over them, but the latter involves more cost.

An aperture of at least 4 inches should be provided along the back of the house in addition to the space left by the rafters.

The height of the building is an important item, and the measurements shown in Fig. 1B may be regarded as the minimum.

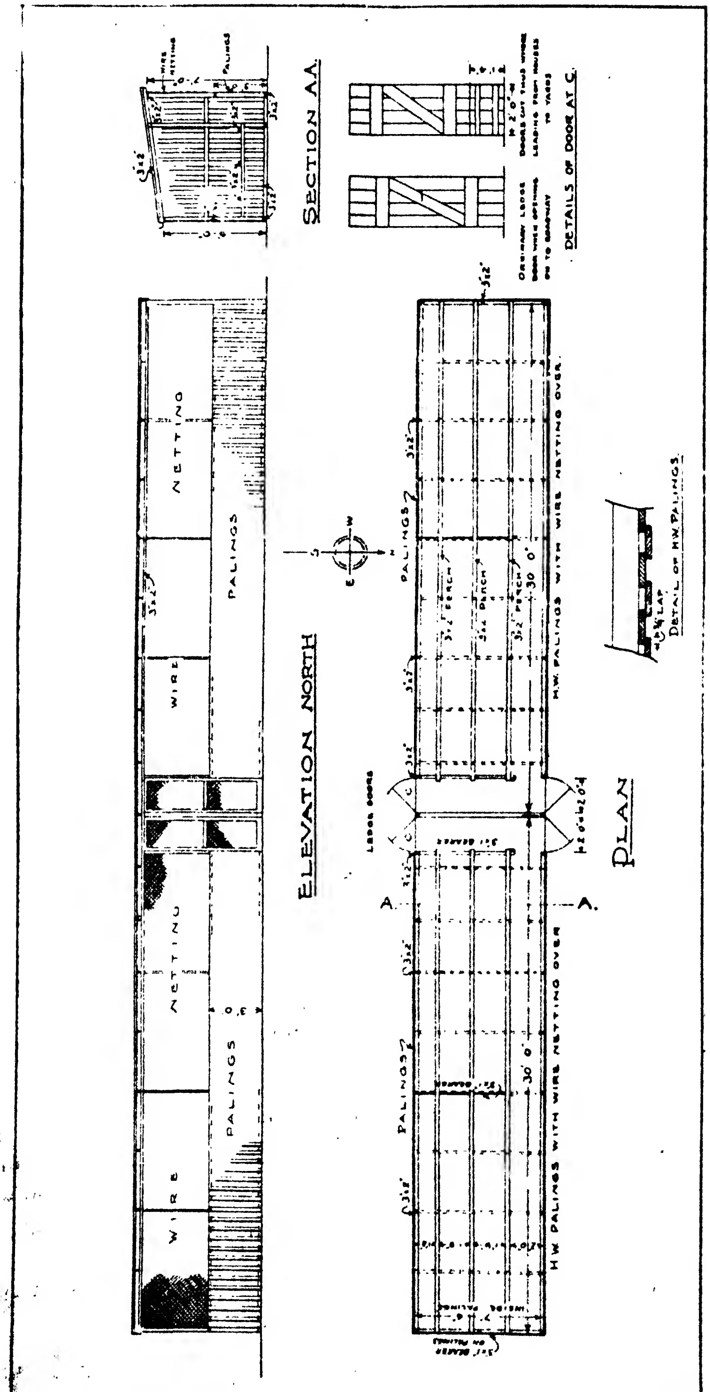


Fig. 2. House for Layers, with Roosting Accommodation only.

The roof is best made to overhang in the front about 2 feet 6 inches, and to ensure that it is securely fixed it is a good plan to strap both rafters and battens to the studs with galvanised hoop iron.

Roosting Houses.

The construction of a double house suitable for roosting accommodation is illustrated in Fig. 2, and this can be converted into a semi-intensive house by doubling its width.

MATERIALS FOR DOUBLE HOUSE FOR LAYERS.

(This house is 60 feet long and is divided into two portions each 30 feet long. Roosting accommodation only is provided.)

Dimensions :—

Length	60 feet.
Width	7 feet 6 inches.
Height (back)	6 feet.
Height (front)	7 feet.

3″ x 2″ H.W. 6/20′, for bottom plates (length).
3″ x 2″ H.W. 1/15′, for bottom plates (ends).
3″ x 2″ Oregon 6/20′, for top plates (length).
3″ x 2″ Oregon 10/16′, for rafters and end plates.
3″ x 2″ Oregon 6/14′, for studs (front).
3″ x 2″ Oregon 3/18′, for studs (back).
3″ x 1 Oregon 10/15′, for centre rails (back, front and ends).
3″ x 1″ Oregon 2/20′, for wire-netting doors.
6″ x 1″ T. & G. Oregon 6/12′, for ledge door.
3″ x 2″ H.W. 12/15′, for three lines of perches.
3″ x 1″ H.W. 2/14′, supports for perches.
230/6′ sawn hardwood palings for back.
90/7′ sawn hardwood palings for ends and division.
4 pairs 12″ japanned "T" hinges.
14 ft. 24 x 1 x 19 wire netting to cover door frames.
56 ft. 48 x 2 x 18 wire netting for front of house.
32 sheets galvanised corrugated iron.
12 lengths of guttering, quarter round.
20 guttering brackets to suit, quarter round.
1 length 3″ downpipe.
2 lb. 1¼ x 14 diamond-headed nails.
5 lb. 2½ x 11 diamond-headed nails.
20 lb. 2 x 11 diamond-headed nails.
5 lb. lead washers.
5 lb. 1¾″ screws, galvanised.

It will be noted that the back of the house is 6 feet high, which is essential if it is desired at any time to alter to the semi-intensive or, for that matter, intensive system. The width of the roosting house is 7 feet 6 inches, and the length can be varied to suit the number of birds to be accommodated.

If this system is adopted it will be necessary to provide a large run, and for each half of a house such as illustrated, which, with three perches running the length of the building, will accommodate 150 birds, the runs should be approximately 150 feet long by 100 feet wide, which allows about 100 square feet per bird. The length and width, however, will be governed by the shape of the block of land, but they should not be less than 1 chain in width, which would necessitate a length of nearly 230 feet to provide the same area as in the case of the first dimensions given.

Intensive System.

On some farms the intensive system (*i.e.*, houses without any runs) is adopted for housing portion of the layers, but under our climatic conditions, and where large areas of land are available, there is nothing to recommend the general adoption of this method of housing layers. On no account should birds intended for breeding stock be housed permanently under this system, as close confinement is not conducive to the robust health necessary in breeding stock and would speedily lead to degeneration. Those who decide to adopt this system would be well advised to build the houses, if possible, in such positions as will permit of erecting runs and converting it into the semi-intensive system later on if desired.

The same type of house as shown for the semi-intensive method can be built for intensive housing, but will accommodate only half the number of birds on the intensive principle. The house should, however, be divided into compartments of about 14 or 15 feet wide to accommodate fifty birds in each. These dividing partitions can be of wire netting, but it is advisable to have a wooden partition where the length exceeds 30 feet. This is to prevent wind sweeping through the building. A floor space of 4 square feet per bird should be allowed under this system.

Dimensions of Houses for Various Numbers of Birds.

Information is frequently sought as to the size of houses required for a given number of birds and in order to furnish this the following particulars are given :—

SEMI-INTENSIVE HOUSES.

No. of Hens.	Length.	Width.	Height at Front.	Height at Back.	No. of Perches.
	ft.	ft.	ft. in.	ft. in.	
100	22	14	8 6	6 6	3
150	22	15	8 6	6 6	4
200	30	16	8 6	6 6	4

ROOSTING HOUSES.

No. of Hens.	Length.	Width.	Height at Front.	Height at Back.	No. of Perches
	ft.	ft.	ft.	ft.	
10 to 15	6	6	6	5	2
20	7	6	6	5	2
30	10	6	6	5	2
50	15	6	7	6	2
100	20	7½	7	6	3
150	30	7½	7	6	3
200	30	9	7	6	4

Where it is desired to run flocks of less than 100 hens under the semi-intensive system, it would be best to build a roosting type of house and make it twice the length shown above, using one end for scratching litter. In such cases it is a good plan to allow the roof to overhang in front to shed driving rain.

Orchard Notes.

FEBRUARY.

C. G. SAVAGE AND H. BROADFOOT.

Pests.

As far as pome fruits are concerned, persistent measures, both preventive and remedial, should be taken against codling moth. Cases supplied or returned to the grower should be immersed at once in boiling water for not less than three minutes, and all grub-infested fruit should be boiled or burnt before the grub leaves it.

Fruit for Canning.

Fortunately for both grower and consumer, it is possible to can fruit, and for that purpose a large proportion of the peaches and apricots grown in the Murrumbidgee Irrigation Area is used. Peaches for canning should be neither over- nor under-ripe, and they should be of good quality—firm, sound and well-developed. Neither the open market nor the canning factory wants poor quality fruit, more particularly if it has been badly handled.

Budding.

The grower who has poorly developed and low-yielding trees can re-work them by budding, so long as the stock is sound and healthy. He will, of course, be careful in his choice of budding wood, and will choose it only from trees whose qualities are worth transmission.

Manuring.

Most plants, especially those which crop heavily, make heavy demands upon the plant-food content of the soil in which they grow. February is the best month in which to apply manure or fertiliser to citrus trees. It should be evenly distributed and worked into the soil around the outer circumference of the tree.

Marketing.

The marketing of apples and pears from the chief apple and pear growing districts will commence this month. The fruit should be handled most carefully, otherwise damage and consequent deterioration will result. The keeping quality of carelessly handled fruit is most adversely affected, and for this the grower even more than the consumer pays. Only fruit so handled that its carrying properties are not jeopardised will pay the grower and give satisfaction to the buyer, no matter whether he be in Sydney or in London. For fruit to open up in good condition it must be carefully handled, packed and transported.

The grower should not pack his fruit when it is wet, nor should it be packed during the heat of the day. If the work of packing cannot be delayed, the fruit cases should be placed in the shadow of some umbrageous tree as soon as they are filled, and carted to the shed as soon as a load is made up. The air in and around the cases should not be stagnant. It should circulate freely among the cases and among their contents.

Not all the fruit on a tree matures at the same time, and it is necessary, therefore, to make several pickings, as by this means greater uniformity in size and in degree of ripeness will be secured, thereby facilitating grading for size and quality and rendering the process of packing easier. In judging the stage at which apples should be picked experience is necessary, but an observant grower soon gains the required skill. Blush, or colour, and colour of seeds are helpful to some extent, but the safest and most trustworthy guide is the ground colour of the fruit. As maturity approaches, the ground colour, which is green, gradually changes to a yellowish hue, and apples are not in the best condition for export until this change has taken place. Neither immature nor over-mature apples should be exported. Picking bags should be used, and the fruit should be placed into them with care, and carefully transferred from them afterwards into boxes quite free from grit and any protrusions such as nails or splinters, which might puncture the skin and thus open the way for the entrance of rot organisms. Care should also be taken when the fruit is carted to the shed, and jolting over rough roads should be guarded against.

The best marketing apples so far as size is concerned are those whose diameter ranges from 2¼ inches to 2¾ inches. This is not only because buyers like a good case-count, but also because apples of the size indicated are, as a rule, better keepers than those whose size is abnormal. This, as has been pointed out previously, is because abnormal size often indicates forced growth, which is frequently accompanied by poor colour. The sizing machine greatly assists the packer in his art. There is still room for judgment of eye and hand in grading for quality, but size-grading is essential to good packing. Each apple should be carefully wrapped, and the wrapping paper should be finished over the stalk in order to lessen liability to punctures, which, whether from stalk, finger nails, or other agents, should be carefully guarded against. If care in this respect was always exercised, losses from blue and other common moulds would not be nearly so great as they are. Important points in packing are to wrap fruit carefully, to place each unit firmly in its place, and to finish the pack so that there is a slight bulge—a case thus packed presents a much better appearance when opened that a case that has been finished slackly. On the other hand, packing too high should also be avoided, or the fruit will be badly bruised when nailed down.

The packer who is naturally slow should not try to increase his speed at the expense of efficiency. Careful (not merely fault finding) supervision

over piece-workers should be exercised, and packers should not be allowed or encouraged to work at a speed which is likely to affect the fruit adversely.

The case should, of course, be strong. For fruit export purposes the Canadian softwood case is undoubtedly the best. Buyers like its attractive appearance, and it is very suited to space packing and to the securing of the desirable top and bottom bulge when packed. The appearance of the case will be further enhanced by the use of an attractive label. For export, clean new cases should be used and they should be lined with clean white paper; a little wood-wool at the bottom and top of the fruit is recommended. The case should be wired, two wires being used, one about 1½ inches from each end of the case; these afford protection against breakages and pillages. The cases should be loaded into clean dry trucks. Stacking in trucks should be done in such a manner as to preclude danger of toppling over during transit, and the cases should never be stacked on the bulge.

Cultivation.

During this month trees are forming the coming season's blossom buds and the grower should endeavour to maintain conditions as nearly ideal as possible. Soil moisture should be conserved by prevention of weed growth and by the maintenance of an effective soil mulch. If good tilth be maintained the soil will be in a condition to absorb and to retain moisture, and the tree will carry on its vital and reproductive functions under favourable conditions.

Fumigation.

For the spraying or fumigation of citrus trees February is a suitable month, but these operations should not be carried out upon trees which are suffering from a lack of moisture or from poor cultivation. It is generally conceded by those who have tried both spraying and fumigation that the latter is the more effective means for controlling pests upon citrus trees. Spraying with miscible oil should be done on a cool, calm day.

Experience shows that to secure the best results from the fumigation of citrus trees infested with scale insects, the period December to March is the best. The fruit is then small and as it grows it throws off the dead scale, with a consequent improvement in appearance. The kill may be and often is just as effective in the late autumn, but by then the fruit has reached almost full size and the scale will not be thrown off by picking time. White wax scale is as a rule easily killed during January and February, as it is then in an early stage of its development. Later the kill is not so complete. Both the "pot" and the "dry" methods of fumigation are in use. The former depends upon the action of sulphuric acid on sodium or potassium cyanide, and the latter upon exposure of calcium cyanide dust to the air.

The dry method has some advantages over the pot system. It is, of course, a distinct advantage to be able to do out-of-door work in bright

sunshine, as then one can work conveniently, rapidly and confidently. Again, a greater number of trees can be treated by the same number of men, and there is no risk of damage to tents by accidental contact with acid. Not only can the dry method be applied during hours of sunshine, but the cost is less in the case of the dry method than in the "pot" method, the ratio being about 2 : 3, the saving being represented by difference in cost of labour; materials under each method cost about the same. It has been found that results are not constant—they vary with the seasons—but after four years' experience it may safely be stated that on the whole the dry method has given satisfactory results. There is need, however, for further experimental work in relation to its reliability over a number of years and under varying seasonal conditions, while the new types of calcium dust offered by manufacturers will also necessitate tests.

The sheets should be large enough to cover the trees completely and to allow an overlap of at least 18 inches on the ground, and should be of calico, strong and closely woven. For convenience of handling, small trees may be covered by tents, but medium sized and large trees could be more conveniently covered with large sheets.

A tree 6 feet high and 6 feet in diameter will require a sheet 25 feet square, and the size of a sheet will vary up to one 50 feet square for a tree 16 feet high and 16 feet in diameter. Unless the trees are small, hoisting poles and ropes are necessary. The ropes should exceed the length of the pole by about 3 feet, and the pole should exceed the height of the tree by at least one foot. For the pot method the following will be required:—A spring balance which will measure accurately to half-an-ounce; a measuring glass marked in fluid ounces; basins or crocks about 6 to 9 inches deep and the same diameter; and chemically pure cyanide and sulphuric acid. For the dry method, measures for the dust, the dust itself and a blower are required. Measures in the form of metal spoons holding ½ to 8 oz. are usually supplied, whilst the blower which gives most satisfactory results is one which will introduce the dust in minutely separated particles without causing very much dust to rise up through the tree.

The tree should be carefully covered with the sheet, and unless the overlap of sheet on the ground is adequate, the margin of the sheet in contact with the ground should have earth placed upon it. If the dry method is adopted the dose of dust should be blown under the tent in a downward direction, but if the pot method is applied the measured quantity of gas-producing materials (the acid and the cyanide in a basin) are placed under the tent. The trees (under both systems) should be left for a period of forty-five minutes. Orchardists who are interested in tree fumigation may obtain free on application to the Under Secretary, Department of Agriculture, Box 36a, G.P.O., Sydney, a copy of a new leaflet which gives details of both systems of fumigation, including dosage tables for trees of all sizes.

1st *March*, 1929.

CONTENTS.

Agricultural Gazette of New South Wales.

Farmers' Experiment Plots.

WHEAT AND OAT VARIETY AND MANURIAL TRIALS, 1928.

Western District (Parkes Centre).

H. BARTLETT, H.D.A., Senior Agricultural Instructor.

EXPERIMENTAL and demonstrational areas with wheat and oats were established in fourteen centres in 1928, the experiment committees of the various branches of the Agricultural Bureau closely co-operating with the Department. Many field days and afternoons were held during the months of September and October, the total attendances being approximately 780.

The Season.

The rainfall at the various centres was as follows:—

RAINFALL.

	Parkes.	Forbes.	Condobolin.	Tullamore.	Trundle.	Peak Hill.	Bogan Gate.	Manildra.
1927—	points.	points.	points.	points.	points.	points.	points.	points.
June ...	107	85	43	112	81	95	92	60
July ...	31	45	72	32	20	4	50	124
August ...	130	69	44	47	128	104	33	122
September	227	172	103	264	228	220	184	168
October ...	225	181	215	167	147	175	29	167
November	273	239	60	232	249	270	229	45
December	307	212	27	221	73	292	167	54
1928—								
January	323	373	333	342	328	299	281	198
February	551	494	1,005	993	703	751	578	746
March ...	217	269	148	93	91	152	131	349
Total on Fallow.	2,391	2,139	2,050	2,503	2,048	2,362	1,774	2,033
1928—								
April ...	114	231	156	170	176	324	168	175
May ...	76	66	59	28	55	60	75	72
June ...	80	157	85	179	133	184	94	156
July ...	259	230	165	216	165	206	186	257
August ...	87	73	37	36	58	35	68	53
September	34	37	40	7	34	26	49	30
October ...	130	96	118	75	91	86	136	163
Total, Growing Period.	780	890	660	711	712	921	776	906

Early in June, 1927, soil conditions were favourable for fallowing, but did not continue so owing to the low rainfall from then on till the end of September. The area of early fallow was therefore rather restricted, but following the substantial spring and early summer rains, considerable progress was made with mid- and late-fallowed areas. The phenomenal rains of January and February caused flooding over most of the level

country and scouring of considerable areas; they did some damage, but resulted also in the asset of a saturated subsoil. Most of the failed areas of 1927, situated to the west, had been cultivated prior to January, and were now in a condition equal to that of fallowed land. The early stubble prepared lands also showed abundance of moisture, but no doubt lacked the benefits of aeration. With the wet summer came also the problem of weed control, and very frequent workings were necessary in many instances to keep the fallows clean. However, the frequent rains and workings produced a mellowness of mulch of very high standard, and enabled most seed-beds to be placed in perfect condition.

The sowing and early winter period were ideal. A firm, moist seed-bed resulted in quick germination of both wheat and oats, and fairly mild temperatures aided rapid growth. At this time grasshoppers were the disturbing factor, sheltering in grass lands at night during late April and May; they would work their way towards mid-day into the young crop, eating it in a face. Many areas had to be resown, and these resulted in only threequarters to half a crop. Many farmers delayed sowing until the first and second weeks of May, with a subsequent reduction of crop-yields, but one which was unavoidable, as earlier-sown crops would have been eaten. However, most crops were dense, well grown and forward by early August, and the dry weather which followed was really necessary to ward off the diseases of mildew, wheat leaf blight, and rust. August, September, and October were particularly dry periods, and many crops showed considerable haying, which was due, not so much to the need of rain, as to the damage caused by hot winds of gale force.

The filling of the ears was sometimes on the slack side, but the grain was generally plump, and in all cases bright. Harvesting was completed without interruption by rain, and the bushel weight was exceptionally high, samples weighing from 65 to 67½ lb. per bushel.

Wheat Variety Trials.

The following farmers co-operated in conducting wheat variety trials:—

S. Tomkins, "Westnook," Tichborne.
Allen Brothers, Calarie, Forbes (Daroobalgie).
J. Jelbart, "Penryn," Trewliga (Peak Hill).
F. Attenborough, "Swanney," Alectown.
J. Townsend, "Willow Vale," Parkes (Goobang).
J. Dunford, Gunningbland
K. Gault, "Lynwood," Trundle.
A. Heinrich, Mayfield, Ootha.
D. R. Gray, Glenora, Albert.
W. Hall, Glenowra, Trundle (Murrumbogie).
S. J. Plowman, Emu Vale, Parkes (Alectown).
W. J. Gravolin, "Rosewood North," Condobolin (Guagong).
I. Tanswell, Cleveden, Parkes (Coradgery).
W. R. Thomas, Back Yamma (Daroobalgie).
A. Wood, "Mount View," Alectown.
T. Carey, "Jungle Park," Tullamore.

Tichborne (S. Tomkins).—Soil, chocolate to black clay loam, self-mulching; wheat 1926; springtoothed September, October, and December, 1927; harrowed twice February; springtoothed March; sown with combine

7th May; seed 64 lb.; superphosphate, 60 lb. per acre. Mildew bad in Nizam, light in Canberra, none in Bena, traces in all other varieties. Dense, well-grown plots, slight haying.

Daroobalgie (Allen Bros.)—Soil, red loam, 9 inches deep; wheat, 1926; disc ploughed, 4 inches, July, 1927; springtoothed twice September, October, January, February, and March; sown with combine 8th May; seed, 64 lb.; superphosphate, 60 lb. per acre. All plots showed signs of haying, particularly Bogan and No. 137.

Peak Hill (J. Jelbart).—Soil, chocolate clay loam, gradually merging to chocolate clay subsoil; wheat, 1926; mouldboard ploughed 4 inches July, 1927; harrowed October, disced January, springtoothed February and March; sown with combine 9th May; seed 60 lb.; superphosphate, 56 lb per acre.

Alectown (F. Attenborough).—Soil, chocolate loam, 9 inches deep; wheat, 1926; mouldboard ploughed 4 inches August, 1927; harrowed September, combined October, harrowed December, combined February and March, harrowed April; sown with combine 16th May; seed, 60 lb.; superphosphate, 60 lb. Nizam suffered most during the dry spring.

Goobang (J. Townsend)—Soil, light loam merging into clay subsoil, 12 inches deep; wheat, 1926; mouldboard ploughed 4 inches August, 1927; springtoothed October, January, February, and March; harrowed April; springtoothed May; sown with combine 11th May; seed, 60 lb.; superphosphate, 60 lb.

Gunningbland (J. Dunford).—Soil, medium red loam, 12 inches deep; wheat, 1926; disc-ploughed 4 inches June, 1927; disced February; springtoothed twice in March and end April; sown with combine 10th May; seed, 60 lb.; superphosphate, 60 lb.

Trundle (K. Gault).—Soil, heavy loam, 9 inches deep; wheat, 1926; mouldboard ploughed 4th June, 1927; harrowed October; combined November and December; harrowed February; combined March; sown with drill 6th May; seed, 60 lb.; superphosphate, 90 lb.

Ootha (A. Hienrich).—Soil, red loam, 9 inches deep; slightly gravelly subsoil; wheat, 1926; mouldboard ploughed 4 inches early October; combined January; scarified early March; sown with combine, 4th May; seed, 48 lb.; superphosphate, 45 lb.

Albert (D. R. Gray).—Soil, light loam, 14 inches deep; grazing for past five years, disc-ploughed, 4th August, 1927; springtoothed September; harrowed September; springtoothed October, November, early January and February; harrowed March; springtoothed March; sown with combine 12th May; seed, 58 lb.; superphosphate, 60 lb. Germination and growth were excellent. During August, September, and October useful rains were entirely absent. Plots hayed to some extent.

Yields of Wheat Variety Trials.

Variety.	Tichborne.	Daroobalgie. (Allen Bros.)	Peak Hill.	Alectown. (F. Attenborough)	Goobang.	Gunningbland.	Trundle.	Ootha.	Albert.	Murrumbogie.	Alectown. (S. J. Plowman.)	Guagong.	Coradgery.	Alectown. (A. Wood.)	Tullamore.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Canberra	36 3	15 4	29 18	...	...	22 30	13 0	14 30	21 18	...	...	4 48	...	...	...
Nabawa	34 48	18 56	24 48	...	...	25 50	14 54	...	...	...	25 6	...	13 53	...	10 35
Waratah	31 36	18 14	...	...	...	...	13 57	14 30	15 38	18 0	18 10	5 12	14 51	27 28	12 20
Bena	31 0	...	26 18	...	24 22	16 52	...	...	...	...	19 23	...	11 34	24 49	...
Nizam	29 48	19 51	...	16 30	19 3	17 0	...	...	...	...	...	...	...	20 33	...
Bogan	34 6	17 42	25 36	...	22 16	25 0	13 40	17 45	...	20 0	24 58	...	14 36	...	...
206 (Plowman's) ...	27 42	...	...	...	...	...	...	...	...	...	...	...	12 5	...	...
Union	...	21 3	...	...	...	12 56	...	...	...	...	...	...	...	...	...
137 (Plowman's) ...	...	13 19	...	...	...	...	...	...	...	...	...	...	...	...	...
Federation	...	...	23 36	...	...	15 37	11 2	...	...	...	...	...	...	24 1	...
Turvey	...	...	21 48	21 0	...	...	...	...	...	...	...	...	...	...	...
Yandilla King ...	...	...	26 18	...	...	...	...	...	...	...	...	...	...	...	...
Riverina	...	...	24 42	22 0	23 52	...	...	...	...	...	...	5 28	17 48	...	...
Boonoo	...	...	...	20 30	...	...	...	...	...	...	...	...	...	...	...
Gresley	...	...	...	...	...	17 51	...	...	21 14	20 0	...	4 45	...	...	...
Bobin	...	...	...	...	...	24 16	15 08	...	...	...	...	...	...	...	...
Cookapoi	...	...	...	...	...	...	13 16	...	...	...	28 15	...	...	...	...
Gluyas Early ...	...	...	...	...	...	...	...	16 0	...	20 0	...	...	...	...	13 50
Rajah	...	...	...	...	...	...	...	19 15	...	...	...	...	...	...	...
Early Bird	...	...	...	...	...	...	...	...	18 41	Failed	...	6 17	...	...	...
Ford	...	...	...	...	...	...	...	...	...	...	19 42	...	...	...	...
Wongan	...	...	...	...	...	...	...	...	...	...	23 4	...	...	...	...
214 (Plowman's) ...	...	...	...	...	...	...	...	...	...	...	24 41	...	...	...	...
212 C (Plowman's) ...	...	...	...	...	...	...	...	...	...	...	23 26	...	...	...	...
206 (Plowman's) ...	...	...	...	...	...	...	...	...	...	...	21 7	...	...	...	...
Hard Federation ...	...	...	...	...	...	...	...	...	...	...	...	4 10	...	...	...
Duri	...	...	...	...	...	...	...	...	...	...	...	...	16 6	...	...
Bald Early	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10 15

Murrumbogie (W. Hall).—Chocolate loam, 6 inches deep; gravelly; subsoil chocolate clay; wheat, 1926; disc-ploughed 4 inches September; springtoothed November, January, March, and April; sown with combine, 28th April; seed, 70 lb.; superphosphate, 60 lb. Early Bird hayed completely and was not harvested.

Alectown (S. J. Plowman).—Soil, cholocate to black, clay loam, self-mulching; wheat, 1926; mouldboard ploughed 4 inches June, 1927; springtoothed October; disced September; springtoothed January and February; disced March; springtoothed May; sown with combine, 17th to 21st May; seed, 56 lb.; superphosphate, 60 lb.

Guagong (W. J. Gravolin).—Soil, red loam 21 inches deep; wheat, 1927; failed; combined April; sown with combine 1st June; seed, 60 lb.; superphosphate, 76 lb. Owing to late arrival of seed, the sowing was too late to enable a satisfactory crop to be grown.

Corudgery (I. Tanswell).—Red loam, 12 inches deep; wheat, 1926; stubble burnt; mouldboard ploughed 4 inches August, 1927; harrowed September; springtoothed February and May; sown with combine 1st and 2nd June; seed, 60 lb.; superphosphate, 70 lb. Germination and growth good. Grasshoppers damaged ripening crop, the losses to plots being about as follows:—Waratah, 6 bus. per acre; 206, 4 bus.; Bena, Duri and Nabawa, 2 bus; Brogan, 1 bus.; Riverina, 1 bus.

Daroobalgie (W. R. Thomas).—The experiment plot area was rather badly damaged by the wheat root grub, rendering the yields useless for comparative purposes.

Alectown (A. Wood).—Soil, chocolate loam; wheat, 1925; mouldboard ploughed 4 inches September, 1927; disced February; springtoothed twice March; harrowed and scarified April; sown with combine 15th May; seed, 60 lb.; superphosphate, 60 lb.

Tullamore (T. Carey).—Soil, heavy clay loam; wheat, 1924; mouldboard ploughed 4 inches June, 1927; disced October, January, and March; harrowed May; sown 2nd June; seed, 60 lb.; superphosphate, 60 lb.

If a comparison of the yields of each locality is made, a marked difference is apparent, the wide range being due to two main factors, namely, soil texture and western location. With regard to the former, the heavier soils generally gave the higher yield during the past season, as, having a greater water absorptive power than the lighter soils, and having been saturated during the preceding summer, they contained a greater moisture reserve for the growing crop during the dry spring months. The western location has an important bearing upon the "finish" of the crop. Here spring conditions are usually harder—that is to say, winds are stronger and temperatures higher, and crops are more forward than those of the eastern localities. The strong winds and high temperatures of September and early October, working upon the forward crops of the west, produced a greater degree of haying than in centres such as Parkes and Tichborne.

Gales completely stripped the flag from some of the more forward varieties, thus affecting the filling of the ear, and days occurred when evaporation from the plant undoubtedly was in excess of assimilation, thus producing the effect so generally noticeable. The stage of maturity when the grain was fully formed and in the milk condition (a stage lasting for a period of about a week) was observed as being most susceptible to wind and heat damage. A variation of one week in maturity either way made an appreciable difference. Some varieties did not suffer to the same degree as others, and it seems most reasonable to suggest that they escaped damage owing to the season of maturity, rather than to any physiological characteristics.

Of the wheat varieties under trial, *Nabawa* has probably given the most pleasing results. Its resistance to flag smut has been well established, but doubt at one time was expressed as to its yielding capacity. This character was said to have been improved in Western Australia, and the yields in this portion of the west appears to substantiate the claim. Included in seven plots, its yield has been consistently high, and a few areas included in the crop competitions showed to advantage. In view of its Western Australian reputation and its behaviour here, farm areas which are subject to flag smut may be sown with a considerable degree of confidence.

Bobin was tried at Gunningbland and Trundle, and is promising as an early wheat. It has behaved well at the experiment farms, and is likely to suit the drier areas.

Bogan, a production of Mr. S. J. Plowman, of Parkes, was included in many trials, and yielded well in all. An early wheat, and a rapid and fairly tall grower, it suits the drier areas, but there are evidences that it is rather bunt-liable, a liability which is not wholly controlled by fungicides. Until further experience upon this score is available, it may be wise to restrict farm areas of this variety.

Canberra generally yielded well in the plots and in farm areas, and recovered some of its lost reputation. It has been largely superseded by Waratah, which continues to do well, and is not likely to again become as prominent as in 1926.

Bena is worthy of mention. During growth some of the plots were rather rank and spongy, and tipping was rather prevalent. Some field crops also suffered from tipping, and prior to harvest the variety lost points in popularity, but Bena possesses the characteristics of Federation as a bag-filler, and both in the plots and field crops the yield proved satisfactory. It may be sown early, preferably on well-fallowed land, and not west of Bogan Gate.

Riverina, possessing some of the qualities of flag smut resistance, attracted some attention; it proved satisfactory as to yield, and is worthy of further trial.

Wheat Manurial Trials.

The following farmers co-operated in conducting wheat manurial trials:—

W. Tyrrell, "Oakleigh," Tichborne.
H. Frecklington, "Rosedale," Goonumbla (Coradgery).
H. Stone, "Kamandra," Parkes (Goobang).
Davies Brothers, "Colwyn," Brolgan.
G. Mill, "Hazelmere," Gunningbland.
A. H. Capell, "Wallsoken," Trundle.
L. J. Mathews, "Voorla," Trundle (Murrumbogie).

Tichborne (W. Tyrrell).—Soil, silty red loam 12 inches deep, red clay subsoil; wheat, 1926; fallow not ploughed; springtoothed June, 1927; combined October and March; combine sown with Canberra on 7th May; 57 lb. seed per acre.

Coradgery (H. Frecklington).—Soil, red loam, 9 inches deep; area had been out to grazing for several years. Disc ploughed, 4th June, 1927; harrowed October; disced October and January; springtoothed January; disced January and end of March. The frequent discing was necessary owing to growth of rubbish during wet summer. Combine sown 20th April with Canberra; 52 lb. seed per acre.

Goobang (H. Stone).—Soil light grey to chocolate loam; wheat, 1926; mouldboard ploughed 4 inches July, 1927; springtoothed October; disced end January; springtoothed March; combine sown 4th May, with Bena; 70 lb. seed per acre.

YIELDS of Wheat Manurial Trials.

Fertiliser per acre.	Tichborne.	Coradgery.	Goobang.	Brolgan.	Gunningbland.	Trundle.	Murrumbogie.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Superphosphate, 50 lb.	16 39	...	...	...	...	...	13 20
" 60 "	16 1	20 36	17 0	25 40	32 48	...	12 40
" 80 "	...	15 46	19 0	26 0	29 55	...	17 39
" 90 "	23 36	...	...	...	...	17 51	...
" 100 "	...	17 45	19 34	25 15	29 40	...	18 59
" 110 "	...	...	...	...	...	20 0	...
" 120 "	...	...	21 27	...	...	...	...
" 125 "	...	...	...	...	...	20 37	...
" 140 "	...	...	...	24 22	...	...	...
" 145 "	...	...	...	...	...	20 50	...
" 150 "	...	...	...	...	29 39	...	...
" 200 "	...	...	...	...	24 26	...	...
Ephos phosphate 60 "	13 20	...	...	...	...		.
" 74 "	...	...	...	...	24 38	...	...
No manure	...	...	...	...	18 14	11 19	11 30

Brolgan (Davies Bros.).—Soil, chocolate clay loam, self-mulching; wheat, 1926; disced 3 inches June, 1927; springtoothed early October, November, March, and early May; combine sown 9th May with Federation; 50 lb. seed per acre.

Gunningbland (G. Mill).—Soil, chocolate to black clay loam, self-mulching; not cropped since 1923; mouldboard ploughed 4 inches October, 1927; scarified November, December, and (followed with harrows) January, February, and March; combined April; combine sown 18th May with Waratah; 60 lb. seed.

Trundle (A. H. Capell).—Soil, chocolate loam; wheat, 1925; mouldboard ploughed 4 inches September, 1927; springtoothed September and October; scarified January and February; springtoothed twice in March; sown with drill, 27th May, Canberra, 70 lb.

Murrumbogie (L. J. Mathews).—Soil, red loam 10 inches deep, slightly gravelly; wheat, 1927, failed; fallow, 1926; springtoothed October, 1927, November, January, February, and April; combine sown, 9th May, with Canberra; 60 lb. seed.

The results are rather interesting, and support the claim that so-called excessive applications of superphosphate (100 lb. and over) do not materially depress yields, even under extremely adverse spring conditions, and that such applications may make possible greatly increased yields if the spring is at all favourable. Suitable conditions at seeding and during the winter resulted in very satisfactory growths, and the plots receiving the heavier quantities of superphosphate showed to advantage. These plots, however, because of their greater bulk, hayed to a greater extent during the period of strong winds, resulting in rather a poorer quality grain. In most cases the number of grains more than compensated for lack in plumpness, and excepting at Coradgery the quality was not below f.a.q. standard.

The use of heavy quantities (100 lb. or more) of superphosphate is not here being advocated with a view to increased wheat production, as experience so far has suggested 70 lb. as the most economical amount to use; but considering the possible value of the carry-over superphosphate in encouraging the growth of native leguminous plants, with consequent increase in the value of the stubble grazing and in the humus content of the soil, there is significance in the fact above referred to—that, even when conditions are most unfavourable, application of superphosphate in excess of the requirements of the crop does not appear to be materially detrimental to its yield. The actual value of the carry-over superphosphate under district conditions of soil and climate cannot yet be stated, nor will any conclusion be possible until applications have been persisted in for a number of years. It is evident, however, that the growth of leguminous plants (trefoils and clovers) is increasing on cropped areas, even though the quantities of superphosphate used have not been high.

On the light loam to loam soils at Tichborne, Goobang, Trundle, Murrumbogie, the heavier quantities (from 90 to 145 lb. per acre) show increased

yields. The increase is small, but the significant point is that the yields were not depressed. Where a no-manure plot was included the difference is considerable.

On the clay loam, self-mulching soils at Brolgan and Gunningbland the growth of all plots was very heavy, the heavily-manured plots producing an excessive growth for such severe spring conditions. From applications above 80 lb. per acre, the growth was a little too bulky, and a reduction in yield was suffered. In 1927 the increase in yield progressed as the amount of superphosphate increased, and it seems wise to persist in experimenting with the larger quantities. At Coradgery, the early sowing (Canberra, 20th April) and the favourable growing conditions produced an exceptionally bulky growth, which had reached the critical stage when the severe conditions occurred. Almost complete haying reduced prospective twelve and thirteen bag yields to half, with grain below f.a.q. standard.

Ephos phosphate was under trial on the loam soil at Tichborne and the heavy soil at Gunningbland. During growth the plots resembled a no-manure plot, and at Tichborne yielded as one, but at Gunningbland the result was somewhat better, the absence of excessive bulk in the growth of this plot reducing the tendency to hay. From other trials made by farmers it appears that Ephos phosphate is very slow acting, and has little, if any, stimulating effect upon the young crop. The results of the past year's trials do not give encouragement to persist in its use.

Rate of Seeding Trials.

The following farmers co-operated in conducting rate of seeding trials:—

W. Tyrrell, "Oakleigh," Tichborne.
W. Scott, Deloraine, Gunning Gap.

Tichborne (W. Tyrrell).—Soil, silty red loam; wheat, 1926; fallow not ploughed; springtoothed June, 1927; combined October and March; sown, 7th May with Canberra; superphosphate, 62 lb. per acre. Results:—

Quantity seed per acre.	bus.	lb.
50 lb.	16	33
60 „	21	57
70 „	22	42

Gunning Gap (W. Scott).—Soil, heavy, red to grey loam; wheat, 1927; failed; fallowed, 1926; disced October, 1927; springtoothed December, January, February, and March; combine sown 10th May with Bena; superphosphate, 56 lb.

Quantity seed per acre.	bus.	lb.
45 lb.	23	20
60 „	24	0
75 „	24	30

During the last five years there has been a steady increase in the amount of seed sown per acre, until most farmers now sow about a bushel. Past experiments and crop competitions suggest that this is the optimum quantity, though the characteristics of the variety and the period of sowing may, of course, warrant a lighter or heavier seeding.

Variety Trials with Oats.

The following farmers co-operated in conducting oat variety trials:—

J. Pearce, "Willow Farm," Mandagery.
G. Field and Sons, "Glenwillyn," Tichborne.
D. L. N. Miller, "Glenlossie," Daroolbagie.
A. P. Unger, "Stony Hill," Alectown.
J. Clatworthy, "Beechmore," Goonumbla (Coradgery).
H. E. Ward, "Gwenvale," Parkes (Goobang).
A. Scrivener, "Hildavale," Gunningbland.
W. J. Dwyer, Daisy Park, Gunning Gap.
C. W. Buckland, "Kangetong," Ootha.
R. H. Doberer, "Good Hope," Derriwong.
R. H. Adam, "Pine Dale," Albert.

Mandagery (J. Pearce).—Soil, medium red loam; wheat, 1926; mouldboard ploughed 4 inches October, 1927; disced end January; harrowed and springtoothed early February; disced end March; combined early May; combine sown 8th-9th May; seed, 50 lb.; superphosphate, 56 lb. per acre.

Tichborne (G. Field and Sons).—Soil, red silty loam 9 inches deep; wheat, 1926; disc-ploughed 4 inches, 1927; combined October, January, February, April; combine sown 16th April; seed, 45 lb.; superphosphate, 57 lb. per acre; plots fed off 15th June.

Daroobalgie (D. L. N. Miller).—Soil, chocolate loam to clay loam; wheat, 1926; disc-ploughed 4 inches July, 1927; combined October, disced December; combined February and April; combine sown 22nd May; seed, 75 lb.; superphosphate, 75 lb..

Alectown (A. P. Unger).—Soil, chocolate clay loam, self-mulching; wheat, 1926; mouldboard ploughed 4½ inches July, 1927; harrowed August, springtoothed September, harrowed October, springtoothed November, scarified December, harrowed January, scarified February, springtoothed and harrowed March; combine sown 20th May; seed, 40 lb.; superphosphate, 50 lb.

Coradgery (J. Clatworthy).—Soil, heavy red loam; wheat, 1927; grazed; disc-cultivated December, 1927; scarified February; harrowed March; combine sown 25th May; seed, 60 lb.; superphosphate, 60 lb.

Goobang (H. Ward).—Light loam, 12 inches deep; oats, 1925; then left to grazing; disc-ploughed 3½ inches, September, 1927; combined October; twice November, January, February; twice March and April; combine sown, 17th May; seed, 45 to 60 lb.; superphosphate, 60 lb.

Gunningbland (A. Scrivener).— Soil, medium red loam 12 inches deep; wheat, 1926; disc-cultivated and harrowed January, 1928; springtoothed and harrowed February; combine sown 19th May; seed, 50 lb.; superphosphate, 60 lb.

Gunning Gap (W. J. Dwyer).—Soil, medium red loam, 9 inches deep; clay subsoil; wheat, 1926; mouldboard ploughed 4 inches August, 1927; springtoothed September, December, February, and April; combine sown 7th May; 50-64 lb. seed; 56 lb. superphosphate.

Ootha (C. W. Buckland).—Soil, red loam 9 inches; clay subsoil; new land; disc-ploughed 3 inches October; springtoothed November, January, and March; sown with drill 30th April and harrowed; seed, 40 lb.; superphosphate, 45 lb.

Derriwong (R. H. Doberer).—Soil, red loam 12 inches deep; wheat, 1926; wheat, 1927, failed; scarified September, 1927; combine sown 22nd April; seed, 40 lb.; superphosphate, 50 lb.

Albert (R. H. Adam).—Soil, red loam 20 inches deep; medium clay subsoil; wheat, 1926; disc-ploughed 4 inches July, 1927; springtoothed October, November, January, February, and April; sown disc drill 7th May; seed, 55 lb.; superphosphate, 50 lb.

These plots were exceptionally well grown, but the hot winds reduced the grain yields by half.

YIELDS of Oat Variety Trials.

Variety.	Mandagery.	Tichborne.	Daroobalgie.	Alectown.	Coradgery.	Goobang.	Gunningblar	Gunning Ga[p]	Ootha.	Derriwong.	Albert.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Algerian ...	64 12	43 14	...	...	...	...	...	...	...	...	...
Myall ...	53 30	...	...	...	...	30 13	24 20	24 36	...	...	...
Guyra ..	62 10	...	...	...	...	31 02	..	...	...	...	...
Mulga ...	47 39	42 07	40 0	45 27	38 0	32 36	32 40	34 32	25 15	25 0	22 3
Budgery ...	...	35 27	..	...	...	...	...	...	...	...	...
Buddah ...	.	41 29	...	33 6	33 20	...	21 12	26 28	30 21	24 20	22 0
Palestine ...	...	30 30		...	...	38 32	...	41 32	. .	...	...
Lachlan ...	.	40 24	34 11	25 37	..	...	...	. .	...	...	...
Belar ...	...	...	36 0	...	22 34	...	19 20	18 8	...	...	16 26
Gidgee ..	. .	...	. .	26 2	35 8	...	22 28	. .	28 18	24 0	...
Sunrise ...	...	...	...	29 0	...	...	...	...	...	...	...

Each year a greater interest in the uses of the oat crop is being evidenced in the western district, and, although as yet the proportion of area sown is not large, there is little doubt that oats will one day have a definite place in the farm rotation. As the production of fat lambs continues to increase, so must more provision be made for their feeding, in the way of green fodder crops and fodder reserves. Oats is the most suitable crop for the purpose. Efforts have been concentrated upon the growing of the early varieties; but with experience gained as to the uses of oats, and the requirements of lambs, it seems there will be a demand also for slower growing, later maturing sorts.

The ultimate grain yield of a variety is not wholly important. Its value as to bulk of early grazing, the rapidity with which fresh growth takes place, and palatability are perhaps of the greatest importance, although the hay or grain yield after grazing is a consideration. When oats are sown and used as suggested, their harvesting must be completed before the wheat harvest commences; but it often happens that late or carry-over lambs would materially benefit if green fodder crops were still available during October or perhaps November. Early varieties of oats tend to

produce seed as soon as warm weather occurs, but the later-maturing sorts will keep green for a longer period, and by frequent grazing may be made to remain succulent until the period required. Areas so treated will not, of course, be harvested. Therefore, while the early varieties are worthy of special attention, the later sorts, such as Guyra and Belar, are also worth considering. It is suggested that the sowing of early, mid-season, and later types may prove useful.

These plots form the basis of a pure seed oat supply, as well as giving an opportunity for observing the habit of growth of the various varieties.

Mulga.—This is the most suitable early oat for the west. It gives the greatest bulk of early growth, and responds well after grazing, giving a very satisfactory harvest yield.

Buddah is somewhat similar to Mulga, but not quite as good.

Palestine lacks bulk of early growth, and is of rather short straw. It appears to be essentially a grain oat, and a productive one. The season is early.

Myall is lighter in growth and yield than Mulga.

Belar and *Guyra* mature in between Mulga and Algerian, and might be useful for continuous grazing.

Algerian is an oat essentially suited to the more eastern portions of the wheat districts, though it may be useful for continuous grazing areas in the mid-western localities.

Field Pea Plots.

The following farmers co-operated with the Department in conducting experiments with field peas:—

J. Clatworthy, "Beechmore," Goonumbla.
D. Kelly, "Wirrocara," Parkes.
J. Donaldson, "Burnley," Parkes.
A. Mill, "Park Dale," Bogan Gate.

Goonumbla.—Soil, heavy red loam 4 inches deep; wheat, 1927, failed; scarified December and February; harrowed March; combine sown 25th May; seed, 60 lb.; superphosphate, 60 lb, The varieties Dun and Grey were tried. Germination and growth were good. Dun is of quicker and bulkier growth.

Bogan Gate.—Soil, red loam; disc-cultivated June, 1927; scarified October; disced January; scarified February and March; combine sown 19th May; seed, 60 lb.; superphosphate, 70 lb.; varieties Dun and Grey.

Parkes (D. Kelly).—Soil, deep red loam; wheat, 1927; combined April and May; combine sown 16th May; seed, 60 lb.; superphosphate, 60 lb; variety, Dun.

Parkes (J. Donaldson).—Soil, red loam to clay loam; wheat, 1927; mouldboard ploughed 4th May, 1928; harrowed twice May; combine sown 31st May; seed, 60 lb.; superphosphate, 56 lb; rolled after sowing; varieties, Grey, Blue, and Dun.

Messrs. Clatworthy and Mill had no attachment for harvesting the plots. The yields on the other plots were as follows:—

	Parkes (D. Kelly).		Parkes (J. Donaldson).	
	bus.	lb.	bus.	lb.
Dun	12	12	10	0
Grey	......		10	0
Blue	......		4	0

The main object of the plots was to determine if field peas can be successfully grown in the Western district. If so, they will form a useful addition to the fodder crops. Several years' trial will be necessary, but their behaviour during the past season was not discouraging. The growing period was favourable, the vines being 18 inches high and completely covering the ground; but the hot, dry conditions at podding time were rather adverse to heavy grain production. During harvesting a fair amount of grain was lost. After harvest, the residues were readily eaten by sheep.

With perhaps the production of earlier maturing varieties, the field pea crop may be of some use to the fat-lamb producer.

Western District (Dubbo Centre).

B. M. ARTHUR, H.D.A., Senior Agricultural Instructor.

During 1928 the following farmers co-operated with the Department in conducting cereal experiments in this district:—

J. D. Berney, "Kildara," Eurimbla, via Cumnock.
Quirk and Everett, "Narrawa," Wellington.
A. D. Dunkley, "Allowah," Terra Bella, via Geurie.
James Bell, "Glenara," Wollumbi Soldiers' Settlement, Geurie.
Harold J. Harvey, "Kindalin," Dubbo.
Barry O'Neill, "Baringa," Narromine.
S. C. Taylor, "Happy Valley," Wyanga.
J. Vearing, "Glenloth," Eumungerie.
J. Parslow, "Cooya," Balladoran.
W. G. Law, "Thistledown," Gilgandra.
J. H. Hodgson, "Studholme," Armatree.
Lindsay Green, "Denison Farm," Leadville.

The Season.

Once again a considerable proportion of this part of the Western district experienced unfavourable conditions from a wheat-growing aspect. These adverse conditions were not only climatic—plagues of grasshoppers, both at sowing time in the autumn, and again in the spring, caused serious losses. An exceptionally dry spring was responsible for many poor crops, mostly on land which had not been well prepared and sown early.

The winter of 1927 was very dry, and the ground became very hard during July to August, when fallowing operations should have been in full swing; in addition, horse and sheep feed was becoming scarce, consequently the area of early-ploughed land was much below the average. Good rains late in September and early October made conditions favourable, and there was considerable activity in ploughing spelled paddocks and in cultivating

up areas which had been sown in the autumn, failed to germinate properly, and been fed off early. Heavy rains were recorded during November and these were followed by frequent and excessive rains during January and February of the new year, aggregating up to 12 inches. This moisture, which thoroughly saturated the soil, caused considerable soil erosion on undulating country, and an unprecedented growth of summer grasses and weeds, particularly stink-grass (*Eragrostis major*), umbrella grass, and Bathurst burr. In many cases, this abnormal growth got the better of the farmer and took complete possession of fallows and other land until March or April, with consequent detriment to the subsequent wheat crop. Good rains during March and April allowed early seedings to be carried out under ideal conditions, and there was a promise of record areas under crop until the arrival of large swarms of grasshoppers throughout the Armatree, Gilgandra, Eumungerie, west of Dubbo, Narromine, and Trangie districts. These fully adult hoppers, assisted by mild conditions and abundance of shelter, ate out and killed the well-germinated young wheat plants. Re-sowings were numerous, and many had to sow even a third time. This was unfortunate, as May was a particularly dry month, with consequent patchy germination. Districts east and south of Dubbo were not troubled by this pest, nor were the centres of Mendooran, Binneway, Dunedoo, and Coolah.

RAINFALL Records.

Locality.	Eurimbla.	Wellington.	Dubbo. (H. Harvey.)	Narromine.	Wyanga.	Balladoran.	Armatree.	Leadville.	Eumungerie.	Dubbo.
	points.	points.	points.	points.	points.	points.	points.	points.	points.	points.
1927—					Not obtainable.					
July	23	...	37	...		...	60	45	59	8
August	85	137	58	134		114	29	74	61	108
September ...	61	112	232	193		70	92	98	144	117
October	100	162	93	177		96	69	65	75	167
November ...	370	562	529	326		294	359	565	484	605
December ...	154	155	147	90		73	397	115	123	105
1928—										
January	558	334	283	379	804	345	344	220	345	284
February ...	622	575	637	857	917	358	324	755	516	630
March	190	242	132	194	179	187	167	342	65	80
Total on fallow ...	2,163	2.279	2,148	2,350	1,400	1,537	1,841	2,279	1,872	2,104
April	340	214	221	205	171	142	89	83	125	189
May	91	56	45	37	43	33	25	38	72	45
June	148	176	114	103	114	123	94	170	127	214
July	322	236	197	234	166	226	174	180	196	228
August	35	30	10	30	56	...	21	48	12	31
September ...	48	32	18	12	15	13	...	...	...	15
October	157	78	49	53	77	117	39	45	45	57
Total, growing period	1,136	822	654	674	642	654	442	559	577	779
		3,101	2,802	3,024	2,042	2,191	2,383	2,838	2,449	2,888

Satisfactory rains sufficient to keep the crops growing nicely were recorded during June and July, but from then on until mid-October the rainfall was practically negligible. The dry conditions were accompanied by frequent strong hot winds, which did not improve the situation. Late

frosts also caused considerable damage to many crops at the flowering stage. In the western portion of the district crops ripened off abnormally early, and did not benefit to any extent by light falls during October, but these rains were of considerable benefit to crops in the eastern portion.

Hay cutting was commenced in some centres late in September, and harvesting by mid-October, which appears to be the earliest date ever recorded. Dry weather throughout November and December allowed harvesting to proceed without interruption, and the majority of the grain was in the bags early in December, which again is unprecedented. Much of the grain was pinched, but was of excellent colour, and practically all of it was able to come up to f.a.q. standard, and that which filled well to record a high bushel weight.

Cultural Details.

Eurimbla.—Heavy chocolate clay loam of limestone formation, clay subsoil, old land; scarified February, 1927, and sown with oats and 50 lb. superphosphate: fed off by sheep; scarified mid-October 4 inches deep, scarified early January, harrowed February, scarified mid-March, again mid-April, springtoothed early May; combine sown 9th May with 60 lb. seed and 60 lb. superphosphate; harrowed after sowing on 11th May. Vacant ground very dirty with wild oats, but kept in check by good germination of wheat where sown. Flag smut in Canberra. Late rains assisted late maturers. Harvested late November.

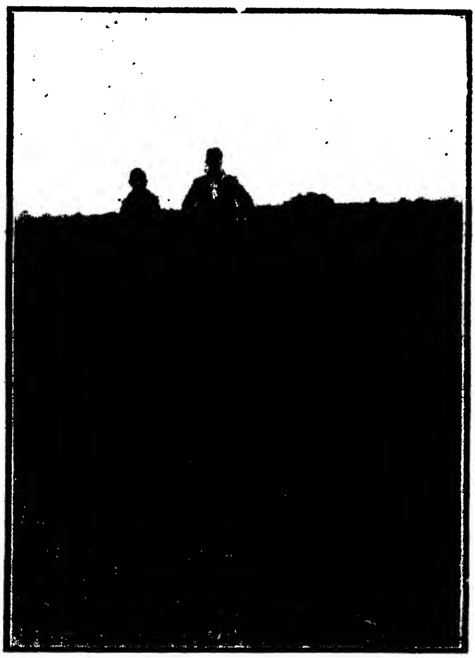
Wellington.—Medium to sandy red loam gravelly ironstone with silt patch at one end; old land: mouldboard ploughed 4 inches August, springtoothed September and harrowed, springtoothed October and harrowed, sheeped during harvest, disced early January, harrowed and springtoothed mid to late January, springtoothed and harrowed February, springtoothed early March, disced late March, harrowed three times during April, springtoothed early May. Many workings due to stink-grass getting away in February, when sheep could not be run owing to boggy condition; disc-drilled 3rd and 4th May at rate of 60 lb. seed and 60 lb. superphosphate per acre. Harrowed and crossed after sowing. Heavy silt ground unduly favoured Canberra plots, both manured and unmanured. Stink-grass affected balance, causing yellowing of flag during winter months. Budgery and Algerian oats difficult to sow evenly through drill.

Geurie (A. D. Dunkley).—Chocolate semi-mulching clay loam, clay subsoil, old land; mouldboard ploughed 3 inches early October, springtoothed early November, late January, and late February, harrowed early April: combine sown 26th and 27th April in moist seed-bed at rate of 50 lb. seed and 56 lb. superphosphate per acre after 125 points rain. Germination and growth excellent, resulting in high average yields of over 30 bushels.

Wollumbi.—Heavy clay gravelly chocolate loam; six crops previously; disc-ploughed September and October; harrowed early January; springtoothed late January; harrowed February; disced late March; springtoothed late April; combine sown 1st and 2nd May, at rate of 53 lb. seed and 60 lb.

superphosphate per acre. Wild oats very thick on any vacant ground, but kept in check by density of crop. Flag smut in Canberra. Harvested 13th to 15th November.

Dubbo.—Medium red sandy loam, clay subsoil 4 inches; five crops previously; last crop oats, 1926; disc-ploughed 3 inches May; disced 4 inches October; springtoothed early November, full depth; springtoothed mid-December, late January, mid-February, early March, late March; harrowed early April; springtoothed and crossed late April, early May; sheeped when necessary; combine sown 7th and 8th May, 58 lb. wheat, 48 to 52 lb. oats, 90 lb. superphosphate, 90 lb. Ephos phosphate; harrowed after sowing, Grasshoppers affected a few plots after germination, especially Canberra no manure plot. Much of Buddah plot lost by shedding. Harvested oats 25th October, wheat 31st October, 11th and 13th November.



A Crop of Nabawa Wheat at Narromine.
Yield, 30 bus. 39 lb. per acre.

Narromine.—Medium red clay loam, clay subsoil, with good drainage; old land under plots 1926; disc-ploughed 4 inches August; springtoothed early October, January, February and March, again early April; springtoothed 30th April; hoe-drill sown 30th April and 1st May, using 55 lb. wheat, 50 lb. oats, and 70 lb. superphosphate; harrowed after sowing. Plots germinated and grew well during winter and early spring, but patches burnt off before harvesting early November. Canberra manured ripened too quickly, and grain was pinched, allowing plot not manured to outyield it. Good yields under the circumstances.

Wyanga.—Medium red sandy loam; six crops previously; mouldboard ploughed 4 inches August; springtoothed October full depth; springtoothed early November, January, February, March, and April; sheeped when necessary; combine sown 16th and 17th May at rate of 62 lb. of seed and 55 lb. superphosphate.

Balladoran.—Medium red to grey sandy loam, clay subsoil; plots, 1926; disced May, 1927; springtoothed deep late October, early November, mid-December, late January, late February, early April, early May; sheeped frequently; disc-drilled 9th and 10th May, using 50 lb. seed, 50 lb. superphosphate, and 70 lb. Ephos phosphate. Grasshoppers were bad at time of

sowing and ate back the young germinating wheat, allowing wild oats to get the upper hand in the majority of the plots, crowding out the wheat plants. Five of the plots had therefore to be cut for hay green to catch oats before seeding. Poor results due mainly to grasshoppers. Harvested from 22nd October to 7th November.

Gilgandra.—Heavy black self-mulching clay loam, belar and buddah country; several crops previously; no manure used before; last crop wheat, 1924; prepared and sown to wheat, 1925, but failed; could not be sown 1926 owing to wet conditions; sown, 1927, but failed to germinate; disced mid-March very shallow; scarified early April and again late April; disc-drill sown 27th April to 8th May; seed, 52 lb.; superphosphate, 54 lb. Yields slightly affected by grasshoppers at sowing and at harvesting, which took place early November. An interesting trial on heavy country, said not to require manuring.

Algerian Oats at Narromine.
Yield, 48 bus. 15 lb. per acre.

Armatree.—Medium to sandy red loam; several previous crops; wheat, 1926; disc-ploughed late June, July; springtoothed deep early October, mid-January, early February; harrowed late February; springtoothed early March; harrowed late March; springtoothed early April and again early May; sown with disc drill 11th and 12th May, using 52 lb. wheat, 50 lb. oats, and 56 lb. superphosphate per acre. Plots germinated very well after 25 points of rain on morning of sowing, and grew well until September, when abnormally light rainfall and hot winds caused them to spindle with resultant poor yields. Myall oats thrashed by wind; harvested late October.

Leadville.—Grey gravelly granite loam, clay subsoil; old land under plots 1926; disc-ploughed 5 inches July-August, springtoothed deep late September, sheeped till November, springtoothed late November, harrowed February, springtoothed twice March and again late April; hoe-drilled 29th and 30th April, except Guyra oats, which was not sown until 11th May owing to late arrival. Plots affected in spring by prolonged dry spell. Gidgee oats thrashed out by hail and wind and not stripped. Harvested 26th to 28th October.

Eumungerie.—Chocolate clay loam, basalt formation; old land; self-sown wheat 1926; disc-ploughed 4 inches July, springtoothed September, disced January, again early March, springtoothed April, sheeped when necessary. Combine sown 10th May at rate of 52 lb. seed and 60 lb. superphosphate per acre. Plots affected by grasshoppers at germination, also when ripening.

Notes on Wheat Varieties.

The outstanding varieties of this season's trials are *Nabawa* and *Bobin.*

Nabawa (Bunyip x Gluyas Early), a variety from Western Australia, was tested at seven different centres, and yielded consistently wherever tried, giving high yields at Eurimbla, Geurie, Dubbo, and Narromine. It is very resistant to flag smut. A white-eared, tall-growing variety, it is somewhat weak in the straw, but promises to become popular.

RESULTS of Wheat Variety Trials, 1928.

Variety.	Geurie (A. D. Dunkley).	Wollumbi S.S., via Geurie.	Eurimbla.	Wellington.	Dubbo.	Narromine.	Wyanga.	Balladoran.	Armatree.	Leadville.	Eumungerie Bureau.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Canberra	34 0	17 25	20 28	32 4	23 32	27 23	16 8	9 49	8 55	15 36	...
Federation	26 2	22 17	22 58	23 26	22 1	18 12	9 53	...	5 17	15 37	...
Federation (Longerenong).	...	...	...	23 23	20 17	...	...	...	...	...	...
Yandilla King ...	26 54	21 0	...	...	...	15 16	13 17	...	...	16 10	...
Turvey	...	24 34	26 44	16 26	22 11	...	...	...	6 42	...	...
Marshall's No. 3 ...	...	...	28 10	...	...	...	...	...	...	15 15	2 39
Nabawa	31 23	...	26 41	20 56	27 9	30 39	...	...	9 34	...	10 30
Bobin	...	...	26 7	...	24 46	30 47	...	...	...	...	...
Waratah	...	16 32	...	...	...	...	17 51	10 45	9 25	18 8	11 36
Wandilla	...	...	...	18 49	...	27 12	...	...	5 37	20 45	...
Riverina	...	...	...	...	24 25	...	...	9 7	11 17	...	12 15
Nizam	30 40	...	...	...	21 10	...	...	...	...	...	9 27
Duri	31 42	...	...	...	...	24 15	...	...	...	8 47	...
Bena	...	24 58	...	...	...	...	...	...	7 28	...	...
Rajah	...	20 33	...	...	...	22 38	...	...	...	...	...
Bald Early	...	...	21 0	...	...	...	10 35	...	...	20 39	...
Ford	...	...	24 2	...	...	...	11 41	...	...	...	...
Union	...	...	...	...	...	29 0	...	...	...	...	...
Duchess	...	20 47	...	16 2	...	...	...	...	...	...	8 59
Ranee	30 6	...	...	...	...	...	...	...	...	...	...
Exquisite	...	...	...	18 29	...	...	...	...	...	...	...
Gresley	...	...	...	...	17 51	...	...	...	...	...	...
Aussie	...	...	...	...	...	...	19 51	...	...	...	...
Penny	...	...	...	...	...	...	10 56	...	...	...	...
Hard Federation ...	...	...	...	...	...	...	...	...	...	21 40	...
4P (Plowman's) ...	...	...	...	...	...	...	13 34	...	...	...	...
Bogan (Plowman's)	...	...	...	...	...	...	12 51	...	...	...	...
Oregon	...	...	...	...	20 42	...	...	...	...	...	...

Bobin (Thew x Steinwedel) was tested in three localities and returned a 27-bushel average. It is a tall-strawed, white-eared wheat, not particularly liable to flag smut; it also stood up well to windy conditions and dry weather. An early maturer.

Riverina again did well in this district. It is also flag smut resistant, and appears to be suitable as a fast-growing wheat for this district.

Wandilla, also a flag smut resister, still continues to show out well.

Rajah and *Ranee* are two Victorian bred wheats which are showing promise and are worthy of further trial.

A Victorian strain of Federation from Longerenong College was tested against our own departmental strain in two centres, and in both instances was outyielded by the New South Wales type. As acclimatisation may have something to do with this, it will be given a further test next season.

Oregon is a very slow-maturing variety from Chile, South America. Seed was forwarded to Mr. Harvey, of Dubbo, two years ago for trial, but the variety would appear to be too late for these parts.

Duri, a brown tip-awned early-maturing variety, yielded well at two centres, but shelled out badly at Leadville in a heavy windstorm.

Waratah again yielded consistently, and is now the most popular variety grown in this district.

Fertiliser Trials with Wheat.

A small manurial trial with Canberra was incorporated in all the wheat variety trials. There are still many who do not use superphosphate as an aid to increased yields in this portion of the Western district, and these trials are carried out annually to try and demonstrate to those who are still sceptical that manuring will pay. Little has yet been done in regard to finding out what is the best quantity to use, but about 56 lb. per acre is a safe and profitable yet economical application. The trials indicated an increased yield at all centres, except two, varying from 2 to 13 bushels, from an application of from 50 to 70 lb. per acre. The results at Dubbo, where the increase was 13 bushels, are probably not quite accurate, as grasshoppers appeared to affect the unmanured area more than the others at time of germination. Decreases of one and one and a half bushels were experienced at Wellington and Narromine, respectively. This was probably due to the manured section maturing more rapidly, and not receiving the benefit of October rains, which filled out the grain in the slower maturing unmanured section, though this was not so dense a crop. Both manured samples of grain were somewhat pinched.

RESULTS of Fertiliser Trials with Canberra Wheat.

Amount of Fertiliser per Acre.	Geurie. (A.D.Dunkley).	Wollumbi S.S. (J. Bell.)	Eurimbla.	Wellington.	Dubbo.	Narromine.	Wyanga.	Balladoran.	Armatree.	Leadville.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Superphosphate—										
50 lb.	...	...	...	...	...	...	...	9 47	...	..
56 lb.	34 0	...	...	...	...	25 49	16 8	...	8 55	...
60 lb.	...	17 25	20 28	30 59	...	...	...	...	...	...
65 lb.	...	...	...	...	...	...	...	...	...	15 36
70 lb.	...	...	...	...	23 32	...	...	...	...	...
Unmanured... ...	30 57	15 35	18 7	32 4	10 20	27 23	12 54	7 7	6 56	12 38
Ephos phosphate 90 lb.	...	...	...	...	14 47	...	...	7 0	...	...
Increase from superphosphate.	3 3	1 50	2 21	...	13 12	...	3 14	2 42	1 59	2 58
Decrease from superphosphate.	...	...	...	1 5	...	1 34	...	...	...	...

C

Ephos phosphate was tested out against superphosphate at two centres on a cost basis in the proportion of nine to seven. At Dubbo the plot fertilised with Ephos phosphate was outyielded by 8¾ bushels, and at Ballidoran by 2¾ bushels. It would appear that it is not sufficiently quick acting to be of immediate use to the wheat plant, which requires stimulating right from the time it germinates.

A large area fertiliser trial was also conducted by Mr. W. G. Law at Gilgandra on heavy black self-mulching clay loam, a class of soil which local opinion claims does not require manuring. Superphosphate was applied at the rate of 54 lb., and seed 52 lb. per acre. The results speak for themselves. A similar trial was carried out at Wellington; but results were not obtainable owing to a late frost badly affecting the paddock in which the trial was conducted.

Following are the results of the Gilgandra trials:—

	bus.	lb.		bus.	lb.
Riverina manured (35·30 acres)...	15	7	Canberra manured (36·47 acres)...	13	17
,, unmanured (17·15 acres)	11	48	,, unmanured (17·15 acres)	11	16
Increase from manuring ...	3	19	Increase from manuring ...	2	1

Rate of Seeding Test.

Following are the results of a rate of seeding test carried out by Mr. H. Harvey, Dubbo:—

Seed per acre. lb.	Yield. bus.	lb.
40	20	46
60	19	49
80	18	48

It will be noticed that the yield decreased 1 bushel for each additional 20 lb. of seed. This was due to the dry spring conditions favouring the lighter seeding, as the other amounts produced denser crops which failed to fill properly.

Diseases of the Wheat Plant.

Flag smut (*Urocystis tritici*) again proved to be by far the worst fungous disease which the wheat plant has to contend with. It is causing a considerable economic loss to many farmers, particularly where good farming methods are not practised, and where those varieties are grown which are particularly liable to it, such as Canberra, Hard Federation, Federation, and Waratah. Many farmers are now growing Nabawa, Wandilla, Florence, and Riverina, which are highly resistant to this disease, in order to check its ravages. Loose smut is occasionally prevalent, particularly in such varieties as Canberra, Turvey, and Currawa. Foot rot and take-all are not serious diseases in this district, though they are occasionally found in the Cumnock and Wellington districts.

Oat Variety Trials.

Oats for grain were tested at seven centres with Algerian as a standard variety for comparison. Algerian gave the best all-round returns, owing to assistance it received from rains during October when other varieties were

too forward to benefit. Guyra and Belar maintained their reputation as midseason varieties suitable for either grain or hay production after being fed off early in their growth. They are not particularly tall growers, have a fairly strong straw, stand up to rough weather well, and produce a good fine hay or plump sample of grain. For purely grazing purposes for early feed, or for silage making, Buddah, Mulga and Gidgee can be recommended, but they are not good grain oats in these districts, as they tend to grow too rank, lodge easily, and shed their grain.

RESULTS of Oat Variety Trials.

Variety.	Eurimbla.	Wellington.	Dubbo.	Narromine.	Balladoran.	Armatree.	Leadville.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Algerian ...	46 0	24 29	36 0	48 15	10 15	2 29	24 0
Belar ...	30 6	...	39 3	...	13 33	10 27	...
Buddah ...	...	...	18 36	...	...	...	...
Budgery ...	...	14 26	...	...	...	...	...
Gidgee ...	24 11	...	...	25 24	...	...	Failed.
Guyra ...	40 6	18 35	...	28 28	17 33	...	19 6
Lachlan ...	...	15 11	30 4	...	...	...	...
Myall ...	...	...	...	...	...	6 16	...
Mulga ...	...	34 20	...	...	15 12	...	..

Riverina District.

G. C. BARTLETT, H.D.A., Agricultural Instructor.

The following farmers co-operated with the Department in conducting cereal experiments during the season 1928:—

- C. W. Moll, Gerogery.
- G. Nation, Jindera.
- W. Goldsworthy, Walbundrie.
- L. Wilson, Howlong.
- E. Ziebarth, Brocklesby.
- G. Perry, Holbrook.
- C. Woodhouse, Tumbarumba.
- T. McAuliffe, Glenroy, Tumbarumba.
- McMillan Brothers, Henty.
- W. Wolter, Munyabla.
- T. Rodman, Uranquinty.
- E. H. G. Eldershaw, Old Junee (Marrar).
- W. Lawrence, Coolamon.
- E. Hamblin, Ganmain.
- J. Gollasch, Milbrulong.
- J. J. Hodgson, South Cullivel, Urana (Brookong).
- N. A. Kerr and Sons, Oaklands.
- F. W. Knight and Sons, Corowa.
- W. Thornton, Berrigan.
- W. Waite, Finley.
- H. Baldwin, Narrandera.
- P. McLennan, Morundah.
- F. A. McPherson and Sons, Jerilderie.
- G. Maver, Deniliquin.
- W. Glen, Mathoura.
- Mesrs. Gale and Symes, Moulamein.
- H. Oberin, Balranald.

The seasonal conditions were most abnormal, following on one of the driest seasons for a long time. A wet tropical autumn made the working of the fallows a problem and caused considerable trouble through severe washouts in the hilly districts, and in other cases flattened and caked the surface and promoted a prolific weed growth. Most of the fallows were put in very fair order again, and in consequence of the abundant moisture, seeding conditions were excellent; except for a few patchy strikes on mixed country the

RAINFALL Records.—The following table shows the rainfall during the fallow and growing periods:—

	Albury (Gerogery).	Jindera.	Walbundrie.	Brocklesby.	Howlong.	Henty.	Munyabla.	Holbrook.	Tumbarumba.	Wagga (Uranquinty).	Coolamon.	Lockhart (Milbig).	Urana.	Oaklands.	Corowa.	Berrigan.	Jerilderie.	Morundah.	Narranders.	Finley.	Deniliquin.	Mathoura.	Moulamein.	Balranald.	Ganmain.
	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.
1927—July ...	328	362	228	220	209	183	244	242	367	174	153	157	122	149	152	142	106	117	127	157	167	165	119	105	155
August ...	423	353	165	158	459	267	196	326	528	104	150	168	150	159	239	136	163	145	141	153	138	113	69	48	132
September	52	70	79	128	88	86	182	54	38	75	129	90	108	107	93	78	66	186	68	106	76	67	122	65	98
October ...	356	403	305	240	433	397	252	464	467	338	337	359	310	271	317	165	182	186	309	190	178	142	191	157	324
November	65	51	43	77	57	41	34	74	176	64	106	25	34	58	38	26	31	31	36	69	41	58	99	63	105
December ...	146	128	125	17	64	45	15	145	128	127	34	13	13	36	30	22	20	16	52	46	16	33	33	11	39
1928—January ...	231	212	175	150	285	288	185	249	183	311	306	243	254	258	275	302	309	298	269	431	183	234	255	235	424
February ...	895	620	675	614	613	709	645	449	389	595	882	412	285	285	561	271	249	299	454	251	323	296	331	282	713
March ...	519	431	307	324	498	536	427	584	584	332	299	244	311	310	467	271	222	287	218	225	206	205	83	83	354
Total on fallow	3,015	2,630	2,097	1,923	2,706	2,552	2,180	2,587	2,810	2,210	2,396	1,711	1,587	1,633	2,172	1,413	1,348	1,565	1,669	1,628	1,328	1,313	1,302	1,049	2,344
1928—April ...	126	92	111	71	114	141	84	196	332	277	247	120	68	105	107	106	83	180	120	7	111	143	156	70	145
May ...	238	230	145	120	205	142	123	183	308	131	123	101	87	119	124	98	112	135	123	103	130	61	71	21	110
June ...	215	217	211	158	195	106	123	194	102	91	93	89	114	125	169	144	147	93	89	137	135	89	96	40	92
July ...	271	376	204	185	311	165	229	237	317	169	183	161	92	102	200	95	119	126	162	106	103	61	66	51	195
August ...	82	82	58	32	67	56	52	92	69	82	67	26	36	44	41	50	62	18	40	64	38	21	19	23	66
September	110	113	113	62	85	99	95	121	298	96	79	78	61	58	99	67	75	82	76	54	58	53	13	21	90
October ...	351	196	101	146	229	267	88	226	364	285	215	289	172	152	274	148	138	451	245	197	151	102	158	148	211
November	17	29	25	4	Nil.	27	11	25	52	Nil.	13	20	17	Nil.	4	2	8	20	Nil.	6	4	Nil.	3	...	...
December ...	15	Nil.	10	35	17	Nil.	Nil.	Nil.	Nil.	Nil.	18	Nil.	15	Nil.	Nil.	33	8	52	44	26	5	Nil.	12	114	63
Total on crop ...	1,425	1,335	978	843	1,223	1,003	805	1,274	1,932	1,131	1,038	884	662	705	1,018	743	752	1,157	899	771	735	530	594	488	972

germination was all to be desired, and in the early winter there were prospects of a record season. The country underwent a great change over the winter, which set in dry with many severe and heavy frosts. It remained dry until well into October, and from the beginning of September onwards the crops, except in the Albury district, rapidly commenced to go off. In the Lockhart district good substantial falls of rain were received early in October, and the crops picked up rapidly and finished much better than expected. The Corowa and Oaklands districts missed most of the rains, and in these districts there were many crops of the Federation type of wheat which ripened up while hardly out of the flag with many large areas of burnt-off patches. This was especially so on the heavy mixed plain. A notable feature about the rainfall was that, although the monthly totals appear very fair, most of the winter and spring rain fell only a few points at a time, accompanied or followed by high winds, and had a very drying effect. Most of the Riverina experienced three months of high winds. Crops from Berrigan, Narrandera west went off rapidly, and there was a marked change from Oaklands, Lockhart east.

Early oats ripened too quickly on account of the continued dry weather, and early wheats appeared at first to be doing the same, but later picked up considerably. All the early sown crops did much the best, and what would have been seasonable sowings in normal seasons turned out to be too late for several of the varieties this season. This is especially the case with Union and wheats of the Federation type.

The plots at Jerilderie, Deniliquin, Moulamein, and Balranald failed, partly owing to seasonal and soil conditions and partly to the late arrival of the seed. They were sown on heavy mixed plain, comparatively new country; that dried out rapidly over the winter and had to be sown very late for those districts.

The harvest came in very quickly—a fortnight early over eastern Riverina, and three weeks early in the western districts.

It will be noticed that some of the oat trials were on stubble or lay ground. As oats are generally grown on stubble in relation to crop rotation, soil fertility and stock reserve, it was decided to conduct some of these plots under farm conditions.

All the ploughing in these experiments was done 4 to 4½ inches deep.

Cultural Details.

Tumbarumba (T. McAuliffe).—Red loam, basalt origin, mixture of quartz, average depth 9 inches, with a clay and gravel subsoil: old cultivation paddock, wheat 1926; lay ground 1927; mouldboard ploughed March, 1928, and harrowed; springtoothed end April; sown with hoe-drill 2nd May, 65 lb. seed and 70 lb. superphosphate per acre; harvested 14th December.

Tumbarumba (C. Woodhouse).—Soil similar to Glenroy, cultivation land over thirty years, last crop wheat 1926; mouldboard ploughed September,

scarified November, February, and early May, harrowed May; sown with hoe-drill 12th May, 75 lb. seed and 84 lb. superphosphate; harvested 7th January. Wet weather delayed sowing.

Gerogery.—Red loam from granite, basalt, and a little ironstone, average depth 8 inches, with clay subsoil; old paddock cultivated twelve years, last crop wheat 1926; mouldboard ploughed July, harrowed September, scarified October, February, April, May; sown with hoe-drill 18th May, using 65 lb. seed, with Yandilla King, Marshall's, and Bena, and 75 lb. seed with the remainder; 85 lb. superphosphate was used in each case; harvested 12th December.

Jindera.—Red loam similar to Gerogery, cultivation paddock over twenty years, last crop wheat 1926; mouldboard ploughed July and August, harrowed September, springtoothed January and March (8-inch points on later operation); sown with combine, late wheats 28th April, Canberra 21st May, other wheats and oats 12th May; wheats, 75 lb seed and 84 lb. superphosphate; oats, 60 lb. seed and 56 lb. superphosphate; harvested 6th December, late wheats 21st December.

Walbundrie.—Heavy grey loam of a silty nature, derived from granite and limestone, average depth 7 inches, with a clay subsoil, old station property under cultivation for forty years, last crop wheat 1926; mouldboard ploughed June, harrowed August, springtoothed October, January, and February, scarified early May; sown with combine 18th May, late wheats 70 lb., early wheats 80 lb., with 80-lb. superphosphate per acre; oats 60 lb., with 40 lb. superphosphate. Manurial trial with Yandilla King sown 18th April; the difference in the early-sown Yandilla King is marked. Plots harvested 8th December.

Brocklesby.—Red loam derived from granite, basalt, and a little ironstone, average depth 8 inches, with clay subsoil, old cultivation land cropped for forty years, last crop wheat 1925, then out for one year; mouldboard ploughed July and August, harrowed September, scarified October, January, and March; sown with combine 9th May, 75 lb. seed and 84 lb. superphosphate per acre; harvested 10th December.

Howlong.—Dark silty loam, river country near Murray, average depth 6 inches, clay subsoil, old land cropped over twenty years, last crop wheat 1926, lay ground 1927; mouldboard ploughed early April, and harrowed twice; sown with hoe-drill 10th May, 60 lb. seed and 90 lb. superphosphate; harvested 21st December.

Holbrook.—Dark-red loam, heavy, semi-silty, derived from granite and limestone, average depth 6 inches, with clay subsoil inclined to pipeclay in parts, old cultivation paddock over twenty years, last crop wheat 1926; mouldboard-ploughed July and August, harrowed September, springtoothed November, disc followed by springtooth February, springtoothed again March, skim-ploughed early May, and harrrowed; sown 22nd May with combine; wheat 80 lb., with 84 lb. superphosphate; oats 70 lb., with 84 lb. superphosphate; harvested 7th December.

Henty.—Dark, heavy loam, semi-silty, average depth 8 inches, with clay subsoil, granite and limestone origin, cultivation land over twenty years. Wheat details: Last crop wheat 1926, before that was cropped and lay continuously, having no fallow before on this paddock; mouldboard-ploughed August, harrowed and scarified January, skim-ploughed early March and harrowed; sown with combine 1st May, using 75 lb. seed and 84 lb. superphosphate per acre; harvested 11th December. Oat details: Old land, wheat 1926, lay ground 1927; mouldboard-ploughed early March and harrowed; sown with combine 26th April, with 60 lb. seed, 60 lb. superphosphate. Guyra seed did not arrive until late and was not sown until 3rd May. Harvested 15th November.

Munyabla.—Red loam, granite basalt origin, average depth 6 inches, with yellow clay subsoil, cultivation land over fifteen years, last crop 1926: mouldboard-ploughed early May, springtoothed November and again February, disced 2 inches and springtoothed April; sown with combine 5th May, wheats 70 lb. seed and 84 lb. superphosphate, oats 60 lb. seed and 60 lb. superphosphate; harvested 15th December. These plots were badly infected with Septoria and rust.

Cranquinty.—Red loam derived from basalt and granite, average depth 9 inches, with clay subsoil, old cultivation land, wheat and oats mostly for hay, last crop oats for hay 1926; mouldboard-ploughed June, harrowed July, scarified October, February and April; sown with disc drill 2nd May, wheats 75 lb., with 84 lb. superphosphate; oats 60 lb., with 84 lb. superphosphate; harvested 6th December.

Old Junee (Marrar).—Red loam, granite and basalt origin, average depth 7 inches, with clay, gravel subsoil, old cultivation land for over thirty years. Wheat details: Last crop wheat 1926; mouldboard-ploughed May and June, harrowed twice August, springtoothed October, scarified December, harrowed January, scarified February; sown with combine 6th May, 75 lb. seed and 84 lb. superphosphate; harvested 17th December. Oats details: Lay ground 1927; mouldboard-ploughed 3 inches and harrowed February and March; sown with combine 12th May, 60 lb. seed and 50 lb. superphosphate; harvested 1st December. Yields of Algerian much affected by grasshoppers.

Ganmain.—Heavy red-loam box country, average depth 6 inches, with clay subsoil, cultivation land over thirty years (wheat, oats on stubble and fallow), last crop wheat 1927. Stubble springtoothed January, disced April, springtoothed May; sown with combine 4th May, and harrowed; 60 lb. seed and 60 lb. nitro superphosphate per acre was used in variety trial. The manurial trial was sown under similar conditions, except that the land was springtoothed instead of disced at end of April; 60 lb. seed per acre was used. Harvested 27th November. Mulga oats were knocked about with October storms.

Milbrulong.—Red loam derived from granite and basalt, average depth 7 inches, with clay subsoil, cultivation over thirty years. Wheat details: Last crop oats 1926; mouldboard-ploughed July, springtoothed October, again November and January, twice in February, again March and twice

in April; sown with hoe-drill 12th May, 75 lb. seed and 112 lb. superphosphate per acre; harvested 4th December. Oat details: Variety and manurial trial on stubble, last crop wheat 1927; stubble burnt and mouldboard-ploughed February, springtoothed March, April, and May; sown with hoe-drill 10th May, using 60 lb. seed per acre and 100 lb. nitro superphosphate with variety trial; harvested 27th November.

Urana (Brookong).—Heavy mixed black and red plain with gilgais and puffbanks, practically new country, fallowed 1926, cropped 1927, failed and was fed off; scarified January and March; sown with combine on 10th May and harrowed; wheats, 75 lb. seed and 84 lb. superphosphate; oats, 60 lb. seed and 56 lb. superphosphate; wheat harvested 10th December, oats 24th November.

Oaklands.—Red loam on heavy side, box country, average depth 7 inches, with clay subsoil, fourth crop, last crop wheat 1926; mouldboard-ploughed July and August, harrowed September, springtoothed November, scarified March, springtoothed April; sown with combine 28th April, 75 lb. seed and 85 lb. superphosphate; harvested 30th November.

Corowa.—Dark heavy, silty loam, average depth 6 inches, with clay subsoil, derived from granite and limestone, cultivation land over thirty years, last crop wheat 1926; mouldboard-ploughed August, harrowed October, springtoothed October, March, April, and May, disced May 2 inches, followed by springtooth; sown with hoe-drill 12th May, wheats 75 lb., with 84 lb. superphosphate; oats, 60 lb. with 56 lb. superphosphate; oats harvested 21st to 30th November, wheats 11th to 17th December.

Berrigan.—Heavy red loam, box country, average depth 6 inches, with clay subsoil, cultivation land over twenty years, last crop wheat 1926; mouldboard-ploughed July, harrowed August, springtoothed September and May, harrowed October, January, April, and May, scarified March and April; wheats sown with hoe-drill 4th May, 75 lb., with 80 lb. superphosphate; oats 8th May, 60 lb., with 60 lb. superphosphate; harvested 26th November.

Finley.—Heavy red loam, box and bull oak country, average depth 6 inches, with clay subsoil, nine years under wheat, last crop wheat 1926; summer-fallowed with disc March, mouldboard-ploughed July, harrowed twice September, springtoothed November, January and February, harrowed January and April; sown with combine 9th May, wheats 75 lb., with 84 lb. superphosphate; oats 60 lb., with 56 lb. superphosphate; harvested 16th November.

Narrandera.—Red loam, granite origin, average depth 8 inches, with clay subsoil, cultivation land cropped for thirty years, last crop wheat 1926; disc-ploughed June, springtoothed August, harrowed August and September, scarified October, harrowed October and December, springtoothed January, scarified February, harrowed February, springtoothed and harrowed March, scarified April and again May; wheats sown 6th May with combine, 75 lb., with 112 lb. superphosphate; oats, 16th May, 60 lb., with

75 lb. superphosphate; harvested 27th November. Grasshoppers damaged plots of oats and Yandilla King, Union, Nizam, and Federation wheats.

Morunda.—Heavy red loam, box and bull-oak country, average depth 6 inches, with clay subsoil, comparatively new land, second crop, last crop wheat 1926; disc-ploughed June, springtoothed October, scarified January, March, and May before sowing; sown with disc drill 18th May, wheats 70 lb. with 84 lb. superphosphate; oats 60 lb. with 56 lb. superphosphate; wheats harvested 20th November, oats 12th November.

Mathoura.—Heavy red, clay, loam, plain country, average depth 6 inches, with clay subsoil, old cultivation land, last crop wheat 1926; mouldboard-ploughed early August and harrowed, springtoothed October, harrowed January, springtoothed February; sown with combine 20th May, wheats 75 lb. with 84 lb. superphosphate, oats 60 lb. with 56 lb. superphosphate; harvested 21st November.

Diseases.

The district was comparatively free from diseases of any serious nature. A little foot-rot was general, but mostly in a small way, as also was loose smut. Flag smut was in evidence, mostly in the usual small quantities, and very little take-all was seen. Rust and Septoria were very prevalent over the winter all over the district, and were responsible for a good deal of the "yellowing off" over the winter that was attributed to the frosts. This no doubt weakened the crops somewhat, and it was found that it caused many to feel the effects of the dry weather later on to a greater degree, and was worse in the late sown crops. These are seasonal fungi, and not much can be done towards control except to avoid over-seeding and to sow varieties not so liable. Most of the crops grew out of the effects of these fungi to a large extent, but in the eastern Riverina, especially the Albury district, stem rust developed considerably, the worst attack being found in the form of a collar ½ to ¾ inch wide round the stem under the covering of the top leaf sheath. It was noticed that rust and Septoria were usually found together both as regards district conditions and susceptibility of the variety Eastern Riverina just escaped a very serious outbreak of rust. In the drier districts where burning off occurred more foot-rot and root-rot were noticed.

Varieties that appear particularly liable to Septoria are Gallipoli, Nabawa, Wandilla, and Riverina, other varieties more than usually susceptible being Union, Federation, and Federation crossbreds, such as Nizam and Wannon. These varieties also appeared rather liable to rust (a liability shared by Bena), although they matured and escaped any serious consequences. Waratah seemed fairly resistant to both rust and blight (Septoria), as also did Aussie and Yandilla King. Canberra and Turvey appear particularly liable to flag smut, other varieties rather liable being Aussie, Marshall's, Gallipoli, Union, Federation, and its selections and crosses, and to some extent Waratah and Bena. Yandilla King seems fairly resistant. Varieties showing high resistance are Wandilla and Riverina, while Nabawa

RESULTS of Wheat Variety Trials.

Variety.	Jindera.	Walbundrie.	Brocklesby.	Gerogery.	Holbrook.	Tumbarumba.	Henty.	Uranquinty.	Old Junee (Marrar).	Coolamon.	Munyabla.	Milbrulong.	Urana (Brookong).	Oaklands.	Corowa.	Berrigan.	Finley.	Narrandera.	Morundah.	Mathoura.	Hay Trials, Coolamon.
	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	t. c. q. lb.
Aussie	34·1	28·1	...	...	...	...	...	...	...	28·0	...	...	...	21·9	...	15·1	9·0	23·4	...	7·1	....
Bena...	28·3	27·7	31·3	33·2	...	25·1	35·1	32·8	28·2	...	...	24·3	...	...	...	...	...	23·4	...	...	....
Boonoo	...	...	...	...	...	...	...	...	30·6	...	...	...	...	...	...	...	...	...	...	...	....
Barootа Wonder	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1 17 0 22
Cadia	...	...	...	...	...	21·1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2 6 2 10
Cleveland	...	...	...	...	...	19·8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1 17 3 1
Duchess	...	...	...	...	...	...	...	...	29·1	...	...	...	...	21·8	...	...	...	...	...	...	....
Duri	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	24·1	...	...	....
Federation (Local)...	30·1	...	22·0	...	20·5	...	...	...	...	...	18·8	21·3	13·1	13·1	16·8	8·3	7·6	15·8	12·1	6·2	....
Federation (Longerenong)... ...	...	...	...	...	...	...	...	...	...	...	...	...	8·3	...	...	8·0	...	...	...	4·1	....
Firbank	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1 15 2 24
Gallipoli	...	24·4	24·1	36·0	...	...	28·5	36·5	25·1	...	...	...	...	...	21·8	7·5	...	...	22·3	...	....
Gresley	...	...	...	27·7	...	...	34·8	32·1	...	...	...	...	...	...	...	...	...	...	...	...	....
Graham	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	7·4	...	...	...	...	....
Huff's Imperial	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3·7	....
Marshall's No. 3	29·1	27·6	29·0	27·2	23·8	25·1	...	36·3	...	25·0	25·3	...	...	...	19·1	...	...	...	...	...	1 13 3 7
Nabawa	38·0	28·5	...	...	...	...	34·3	...	36·6	20·8	...	35·1	9·7	...	22·6	...	17·2	24·1	...	7·1	....
Nizam	...	...	...	24·0	20·5	...	...	...	...	31·4	...	...	19·2	21·6	...	8·3	8·0	15·1	16·8	4·3	....
Onas	...	...	...	...	...	...	...	...	...	21·6	...	26·2	...	...	...	7·8	...	...	...	...	....
Ranee	...	...	...	...	...	...	...	...	...	...	...	...	14·1	23·9	...	13·4	13·6	...	14·5	...	....
Rajah	...	...	25·5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	16·5	...	....
Riverina	...	...	...	...	...	...	...	...	...	26·5	...	...	...	...	...	...	...	...	14·0	...	....
Turvey	...	...	23·3	26·5	24·1	29·6	...	29·2	...	...	...	...	...	...	15·0	...	...	...	17·0	...	2 0 2 27
Union	22·5	20·7	23·7	25·7	19·5	14·1	24·4	26·6	24·5	28·1	19·8	17·2	10·8	...	16·1	9·1	9·3	15·8	11·7	3·5	....
Waratah	30·1	26·3	30·0	30·8	21·3	...	27·3	0·1	30·4	21·1	25·8	24·2	16·0	22·5	20·5	14·3	10·5	20·0	19·7	7·5	....
Wandilla	...	...	...	...	...	...	25·8	...	...	...	...	...	...	...	...	...	...	...	...	...	....
Yandilla King	33·2	24·0	25·8	31·8	20·6	24·7	30·0	29·4	...	27·1	21·6	22·7	...	19·6	20·6	...	...	16·4	...	...	2 5 1 25
Zealand	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1 14 2 18

showed complete resistance under field conditions. Canberra, Marshall's, and Turvey show appreciable susceptibility to loose smut, Canberra particularly. Aussie, Bena, Yandilla King, Waratah, and Gallipoli were not affected with this disease.

Notes on Wheat Varieties

Marshall's No. 3 did very well in several parts of the Riverina, and seems to suit the lighter soils better than Yandilla King. Yandilla King as a late variety again did very well where sown early. These two varieties so far appear still the best of the late maturing class for the Riverina, but experiments show that they should be sown before May. Turvey does not yield up to appearances, and except in one or two cases is much inferior to Yandilla King, and is now being fast replaced by this variety. Of the midseason class Bena, Gallipoli, and Nabawa gave good results, and are very promising wheats. Nabawa finished very well indeed. A notable feature is the outstanding yields of Nabawa in one or two cases. This was the case also last year. It must be remembered that these two have been very dry years.

The early wheats appeared to be going off rapidly earlier in the season, but later picked up very well and finished with good results. This is particularly the case with Waratah and Aussie. Union and Nizam were very disappointing, but all wheats of the Federation class were attacked very badly with Septoria and rust, and later on ripened off very quickly. The season was very much against them, and they are still favoured varieties for midseason sowing.

Ranee is a Victorian introduction that suits the drier districts very well.

The New South Wales Federation gave better results than the Longerenong strain and appears hardier, and is not quite so closely coupled in the head.

Fertiliser Trials with Wheat.

The experiments show again that under average conditions an application of 84 lb. superphosphate gives the most profitable results, but under very good conditions 112 lb. can be applied to advantage.

RESULTS of Fertiliser Trials with Wheat.

Fertiliser per acre.	Jindera (Union).	Walbundrie (Yandilla King).	Brocklesby (Marshall's No. 3).	Tumbarumba (Turvey).	Henty (Wandilla).	Uranquinty (Yandilla King).	Old Junee (Marrar) (Bena).	Coolamon (Nizam).	Milbrulong (Union).	Oaklands (Nizam).	Corowa (Federation).	Berrigan (Union).	Finley (Union).	Morundah (Turvey).	Mathoura (Federation).	Hay Trial, Coolamon (Baroota Wonder).
	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	t. c. q. lb.
56 lb. superphosphate	24·2	27·0	25·5	24·8	25·8	25·6	31·7	21·0	13·3	16·0	14·1	6·7	9·3	12·8	...	1 8 0 8
75 lb. ,, ...	...	...	...	...	...	...	34·0	24·1	...	...	...	...	...	...	...	......
84 lb. ,, ...	24·8	31·5	29·0	29·6	27·6	29·4	...	27·0	17·2	21·6	16·8	9·1	9·5	17·6	4·2	1 18 3 23
95 lb. ,, ...	...	...	...	...	...	...	34·0	...	...	...	...	...	...	...	...	....
112 lb. ,, ...	29·0	28·5	30·8	32·1	27·3	32·5	...	27·1	19·8	24·2	19·8	6·2	10·4	15·6	3·7	1 17 1 12
160 lb. ,, ...	...	...	...	...	...	...	...	...	...	...	...	...	11·5	...	...	....
110 lb. Ephos phosphate	...	...	20·7	...	...	...	...	25·0	...	14·5	...	..	...	...	...	......

RESULTS of Oat Variety Trials.

	Jindera.	Walbundrie.	Howlong.	Holbrook.	Tumbarumba.	Henty.	Uranquinty.	Munyabla.	Old Junee (Marrar).	Coolamon.	Milbrulong.	Urana (Brookong.)	Corowa.	Berrigan.	Finley.	Narrandera.	Morundah.	Mathoura.	Hay Trial, Coolamon.	Hay Trial, Ganmain.
	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	t. c. q. lb.	t. c. q. lb.
Algerian	41.2	35.7	...	51.3	37.2	43.4	36.1	36.5	34.6	48.0	17.3	...	39.7	7.7	...	21.6	13.4	22.8	1 13 0 6	1 12 2 22
Belar	...	...	...	39.0	30.1	...	33.7	39.3	...	59.3	18.4	26.2	...	...	8.6	...	25.6	17.8	1 7 3 8	1 6 3 13
Buddah	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10.2	....	....
Fulghum	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	13.7	....	1 1 2 6
Gidgee	...	34.2	...	...	38.8	47.6	...	...	42.2	40.0	20.6	28.1	...	26.2	...	...	14.2	12.1	....	....
Guyra	46.5	36.6	...	53.7	42.1	37.1	40.5	...	...	56.0	...	...	38.5	...	...	25.6	...	...	1 13 3 9	....
Laggan	...	...	...	...	...	...	...	...	42.1	...	...	...	...	...	...	...	...	...	....	1 4 1 6
Lachlan	...	39.7	...	43.0	35.9	47.5	...	27.9	41.6	...	17.9	...	18.6	13.8	6.3	23.7	16.4	...	....	....
Mulga	59.0	28.8	...	37.5	33.3	56.4	35.8	43.6	...	54.0	28.2	32.3	25.6	26.1	25.5	20.2	...	...	....	0 16 0 20
Myall...	41.8	...	...	...	33.3	...	...	...	...	...	...	15.5	27.7	20.8	...	21.1	...	...	1 8 1 0	....
Palestine	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	11.2	....	1 2 3 26
Quandong	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	11.1	....	....

Ephos phosphate appears a failure compared with commercial superphosphate. The crops lagged behind very much in the early stages and did not finish nearly so well. In fact at Brocklesby at one stage the Ephos plot was almost comparable to an unmanured one.

Rate of Seeding Trials with Wheat.

In rate of seeding trials with wheat, too heavy seeding caused overcrowding with weak stalks, smaller heads and a greater disease susceptibility, especially to rust and Septoria (blight).

Under average conditions, sown in season, 65 lb. per acre with the early sown wheats gives good results and 70 to 75 lb. with the later sown varieties, increasing this amount a little as the sowing is prolonged. The results were as follows:—

RESULTS of Rate of Seeding Trials with Wheat.

Rate of Seeding per acre.	Jindera (Canberra).	Walbundrie (Yandilla King)	Brocklesby (Marshall's No. 3	Tumbarumba (Turvey).	Henty (Wandilla).	Uranquinty (Yandilla King)	Milbrulong (Union).	Corowa (Federation).	Berrigan (Federation).	Finley (Union).	Morundah (Turvey).	Mathoura (Federation).	Hay Trial, Coolamon (Baroota Wonder).
	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	t. c. q. lb.
60 lb.	...	...	...	...	28·6	...	...	...	...	...	...	...	1 10 3 6
65 lb.	28·4	33·0	28·3	...	...	31·1	18·2	14·8	9·1	7·8	17·6	...	....
70 lb.	...	..	...	...	27·6	...	...	...	...	...	...	...	1 17 1 12
75 lb.	22·3	30·0	29·0	28·2	..	29·4	19·8	16·8	9·1	9·5	17·0	6·2	....
80 lb.	...	...	...	...	27·3	...	...	...	...	...	...	...	....
85 lb.	14·6	31·5	28·5	23·0	...	28·2	17·4	17·5	7·5	7·1	15·6	5·0	....
90 lb.	...	...	...	...	...	...	...	...	...	...	...	...	1 17 1 5

Cultivation Trial at Milbrulong.

A cultivation trial at Milbrulong (variety Union) resulted as follows:—

		Bushels.
Long summer fallow	......	17.7
Long summer fallow, not ploughed	......	17.8
Winter fallow	......	17.4

The abnormal seasonal conditions, together with the excellent condition of the paddock, were against obtaining any large differences in these yields. The season and time of sowing did not suit the variety.

Notes on Oat Varieties.

Algerian still appears to be the best late oat for the Riverina, although Guyra is giving good results and is gaining in popularity. Belar is a promising midseason oat for dual purpose. Mulga is still the best early oat for grazing, hay and grain. It has to be caught quickly or else it will lodge easily. Gidgee is an excellent yielder, but not so good in the straw as Mulga. Myall is similar in many respects to Mulga, but not quite so good all round.

Fertiliser Trials with Oats.

Excellent results are obtained with up to 84 lb. of superphosphate with oats for grain. For hay it appears that oats respond better to a little nitrogen (up to 2 per cent. as contained in nitro superphosphate or Cresco ammonia phosphate), but from stronger nitrogen mixtures such as M17 (6 per cent.) not such good results are obtained.

RESULTS of Fertiliser Trials with Oats.

	Uranquinty (Algerian).	Old Junee (Marrar). (Lachlan).	Milbrulong (Mulga).	Hay Trial, Ganmain (Mulga).
	bus.	bus.	bus.	t. c. q. lb
No manure	30·1	30·9	19·3	0 14 1 22
56 lb. superphosphate per acre ...	36·4	41·6	22·4	0 17 0 6
84 lb. ,, ,, ...	36·1	......	......	1 0 3 13
112 lb. ,, ,, ...	38·3	......	25·3	....
*100 lb. M16 per acre	......	......	26·0	....
*100 lb M17 per acre	31·4	45·2	......	1 1 3 21
*100 lb. nitro superphosphate ...	33·3	44·0	28·2	1 1 1 0
100 lb. blood and bone (one-third) and superphosphate (two-thirds) ...	......	......	......	1 1 2 15
*84 lb. Cresco ammonia phosphate	......	......	......	1 4 2 11

* Nitro superphosphate and Cresco ammonia phosphate are mixtures containing superphosphate and about 2 per cent. added nitrogen. M16 and M17 are mixtures containing superphosphate and about 6.5 per cent. added nitrogen.

A CORRECTION.

ON page 935 of the December, 1928, issue, in connection with an article entitled "The Sheep Blowfly," the minimum quantity of water required to dissolve 1 lb. of arsenic and 3¼ oz. of caustic soda was stated to be 11 pints; the amount should have been 1.1 pints.

INFECTIOUS DISEASES REPORTED IN JANUARY.

THE following outbreaks of the more important infectious diseases were reported during the month of January, 1929:—

Anthrax	3
Blackleg	3
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia contagiosa	11
Swine fever	Nil.
Contagious pneumonia	Nil.

—MAX HENRY, Chief Veterinary Surgeon.

IF the farm is considered as an undertaking in which the farmer intends to realise the value of his own ability and the work of himself and his family, book-keeping offers the only standard criteria, supplying as it does, not only comparative figures, but also the basic figures.

Malting Barley Growing in South Australia.

E. S. CLAYTON, H.D.A., Senior Experimentalist.

SOUTH AUSTRALIA has a very successful malting barley industry. That State not only exports barley of excellent quality to the other States of the Commonwealth, but also has a substantial overseas trade. The area annually devoted to malting barley is usually in the vicinity of 245,000 acres.

Most of the barley is grown on Yorke Peninsula and Kangaroo Island. As the Peninsula is only about 20 miles across, tapering down to a point, it will be seen that the conditions are ideal from a climatic point of view for slow ripening. The rainfall is low, the soil usually fairly light in texture, and the atmosphere is mild, for unless the wind is from the north, it must blow across miles of water. The result of this favourable combination of factors is that short dense crops of excellent quality soft bright malting barley are produced. The grain is of better quality than that produced in the south-east of South Australia, and, of course, much softer and better than the barley grown in New South Wales.

Cultural Methods.

The land on which the crop is grown is of a calcareous nature, and is usually not fallowed for barley, which is usually grown on wheat stubble. The most favoured rotation is fallow, wheat, barley. The land is not as a rule ploughed for barley, but is cultivated two or three times with a scarifier to form a good seed-bed. Pryor is by far the most popular variety, but Duckbill and Chevalier are also grown.

A Crop of Pryor Malting Barley.

This crop was grown on Mr. E. B. Schrapel's property at Yorke Peninsula, South Australia. Note the short, dense growth, and the poor, white, calcareous soil on which it is growing. Estimated yield, 7 bags (on stubbles).

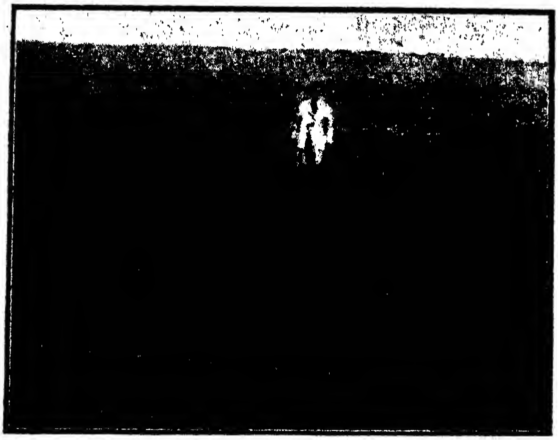
From 55 to 60 lb. of seed and 56 to 112 lb. of superphosphate per acre are used. Sowing takes place in June, and the crop is harvested in November. Eighteen-bushel averages are quite common and sometimes averages of 30 bushels per acre are obtained. The fact that the crop is grown on stubble land and still gives satisfactory yields means that the cost of

production is low, and this, coupled with the fact that large individual areas are sown, makes the industry very profitable. If the crop is grown on fallowed land, taller growth of course results, and the crop does not stand up so well. It is rather surprising to note the large areas of malting barley grown by individual farmers. On one man's farm, 1,000 acres were under barley, and single-owner areas of 500 acres were quite common.

Comparative Freedom from Disease.

The crop takes very little disease, smut being the only one in evidence. The seed is generally treated with formalin to prevent this disease, but complete control does not appear to be achieved. The large take-all patches that are sometimes seen in the wheat crops do not occur in the barley crops.

Where barley is grown in New South Wales it is a common sight to see the barley appearing in the wheat crops and *vice versa*, but in South Australia the crops of both barley and wheat are free of admixtures. The chief reason for this cleanliness is that both crops are sown late in the season (June), so that all self-sown wheat or barley has a chance to germinate and be destroyed before the main crop is sown. Wheat is usually sown first and then the barley. In the south-eastern district of South Australia barley is sown very late, in some cases as late as August. Heavy yields are obtained there, but the quality is not so good as that of the barley grown on Yorke Peninsula.



Pryor Barley on Mallee Land, Yorke Peninsula, South Australia.
This is a short, dense, clean crop. Note the strip of oats growing on the headland. This acts as a barrier should army worm make their appearance.

The Malting Barley Pool.

The formation of a barley pool for Yorke Peninsula growers appears to have been an important factor in rendering the industry profitable. Under the open market system the price was in the vicinity of 3s. 3d. a bushel, but since the pool has been operating the final price has never yet been under 3s. 6d., and has been as high as 6s. a bushel, but, of course, it fluctuates. The pool grades all its barley, both for the local maltsters and the English trade.

The Position in New South Wales.

About 4,000 acres of land is usually devoted to the growing of malting barley in this State, and the average yield is in the vicinity of 14 bushels per acre. It is chiefly on the North-western Slopes and in the Riverina that barley is grown.

It is likely that because of climatic peculiarities this State will never produce quite such good quality barley as that grown on Yorke Peninsula. Nevertheless, the quality is satisfactory, and there is room for some extension of the industry in suitable districts. South Australian experience seems to indicate that barley-growing was not on a satisfactory basis until the advent of the pool.

The growing of barley on fallowed land is attended with risk as the crop is so likely to lodge; it may therefore be preferable to grow it on stubble land in New South Wales. It is possible that there may be some advantage in the short-strawed dense safe crop produced at a low cost per acre on stubble ground, even if the yield is low, compared with the taller and heavier, but more risky crop grown on fallowed land.

TUBERCLE-FREE HERDS.

OF the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number tested.	Expiry date of this Certification.
A. V. Chaffey, "Lilydale," Glen Innes	16	14 Feb., 1929
Lunacy Department, Kenmore Mental Hospital	99	17 ,, 1929
Tudor House School, Moss Vale	6	22 ,, 1929
Australian Missionary College, Cooranbong	57	24 ,, 1929
Department of Education, Hurlstone Agricultural High School	33	1 Mar., 1929
Mr. Stanton, Leicester Park, Mittagong	63	6 ,, 1929
Department of Education, Yanco Agricultural High School	34	12 ,, 1929
J. F. Chaffey, Glen Innes (Ayrshires)	58	2 May, 1929
F. W. Hopley, Leeton	25	14 ,, 1929
P. F. Mooney, Cafala	33	16 ,, 1929
Department of Education, Gosford Farm Homes	16	16 ,, 1929
William Thompson Masonic School, Baulkham Hills	29	23 ,, 1929
Lunacy Department, Parramatta Mental Hospital	93	6 June, 1929
E. P. Perry, Nundorah, Parkville (Guernseys)	26	12 ,, 1929
Dominican Convent, Moss Vale	4	26 ,, 1929
Sacred Heart Convent, Bowral	10	21 July, 1929
St. Patrick's College, Goulburn	8	26 ,, 1929
Presbyterian Ladies College, Goulburn	4	26 ,, 1929
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	42	9 Aug., 1929
Kyong School, Moss Vale	2	21 ,, 1929
Department of Education, Mittagong Farm Homes	34	23 ,, 1929
Blessed Chanel's Seminary, Mittagong	4	25 ,, 1929
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	75	25 ,, 1929
Waiaroi College, Orange	5	30 ,, 1929
Riverstone Meat Co., Riverstone Meat Works, Riverstone	127	5 Sept., 1929
J. L. W. Barton, Wallerawang	22	11 Oct., 1929
Department of Education, Eastwood Home	9	5 Dec., 1929
Lunacy Department, Morisset Mental Hospital	21	7 ,, 1929
J. Davies, Puen Buen, Scone (Jerseys)	39	12 ,, 1929
Kinross Bros., Minnamurra, Inverell (Guernseys)	73	14 ,, 1929
Lunacy Department, Callan Park Mental Hospital	22	19 ,, 1929
Miss Brennan, Arrankamp, Bowral	14	20 ,, 1929
A. Shaw, Barrington	36	11 Jan., 1930
Lunacy Department, Rydalmere Mental Hospital	66	11 ,, 1930
New England Girls' Grammar School, Armidale	18	16 ,, 1930
G. Miller, Casula	15	1 Feb., 1930

—MAX HENRY, Chief Veterinary Surgeon.

Imports and Exports of Fruit.

The following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 31st December, 1928:—

Description.	Imports.	Exports.
Interstate.		
	Cases.	Cases.
Fresh Fruits ...	596,323	269,923
,, Tomatoes..	145,702	...
	lb.	lb.
Canned Fruits ..	89,460	2,828
Dried Fruits—		
Unspecified ...	23,006	1,400
Currants ..	9,772	784
Raisins ..	8,596	560
Apricots ...	1,736	..
Apples ...	3,864	56
Peaches ...	3,192	...
Pears	448	.
Prunes ...	4,200	616

Description.	Country of Origin.	Imports.	Exports.
Oversea.			
Fresh Fruits—		Centals.	Centals.
Apples ..	....	...	371
Bananas ...	....	8,523	6
Lemons ...	....	...	69
Oranges ...	....	...	38,175
Pears	....	...	64
Pineapples ...	....	...	873
Other	....	263	7,058
Dried Fruits—		lb.	lb.
Apples ...	....	...	972
Apricots ...	....	...	474
Currants ..	....	...	8,070
Prunes ...	France	904	320
	U.S.A.	132,620	...
Peaches ...	....	...	142
Raisins—			
Sultanas ...	Asia Minor ..	64,611	12,832
	U.S.A.	113,029	...
Lexias ...	....	...	336
Other ..	Spain	14,907	1,285
	U.S.A.	10,000	..
Dates	Arabia	48	38,694
	Mesopotamia ...	3,681,807	...
	Persia	24,605	...
	Syria	1,680	..
Other—	Asia Minor ...	125,294	3,537
	British Malaya ..	6,344	...
	China	8,884	...
	Czecho-Slovakia	210	...
	Italy	270	...
	Japan	400	...
	Spain	244	...
	Turkey	36,588	...
	U.S.A ...	74,748	...
	United Kingdom	286	..
Preserved in liquid—			
Apricots ...	....	...	72,613
Peaches ...	....	...	197,982
Pears ...	....	...	17,108
Pineapples ...	....	...	799
Raspberries	....	...	240
Other ...	....	...	14,654

A Hint for the Bee-keeper.

Whenever bees are inclined to be cross, or have been unduly disturbed due to robbing or taking off honey, transferring, &c., writes a beekeeper in the *American Bee Journal*, never light your smoker on going into the apiary before putting on your veil, and never take off the veil until you have disposed of the smoker. The odour of the smoker causes the otherwise harmless bees, whose keenest sense is smell, to recognise you as their plaguer, and quickly brings about your head a swarm of angry, stinging bees.

Crop-growing Competitions, 1928.

FURTHER DISCUSSIONS ON THE METHODS ADOPTED.

Central Western District.

W. D. KERLE, H.D.A., Senior Agricultural Instructor.

CROP competitions have assisted very materially in stimulating interest in better farming methods in the central western district. They have been in vogue for five years, and the difference between the crops submitted for judging now and five years ago is most marked. It is quite obvious also that many farmers who do not usually enter these competitions adopt the methods of the winners, and purchase their seed from winning blocks. This results in increased production throughout the district.

The crops entered this season were well above the average of previous years, the winning blocks in all cases being of outstanding merit.

The following associations conducted competitions:—

	Entries.
Grenfell P.A. and H. Association (Crop Competition)	29
Cowra P.A. and H. Association (Fallow and Crop Competition)	5
Cowra P.A. and H. Association (Crop Competition--Henley Cup)	18
Cowra P.A. and H. Association (Crop Competition—under 640 acres)... ...	7
Eugowra P. and A. Association (Crop Competition)	8
Canowindra P. and A. Association (Crop Competition)	22
Molong P. and A. Association (Crop Competition)	6
Cranbury Agricultural Bureau (Crop Competition)	11
Ooma Agricultural Bureau (Crop Competition)	14
Total	120

The Season.

The season will be chiefly remembered as one of heavy summer rainfall, ideal sowing conditions, an early dry spring, poor "finishing" rains, and the serious inroads of rust.

The necessity for carrying out the initial ploughing of the fallows under favourable conditions prevented this being done early, the winter of 1927 being abnormally dry and frosts were severe. Heavy rain early in October, which saved the crops of that year, put the ground in the most favourable condition for ploughing, and the majority of fallows were commenced at that time, except in more favoured localities. During November good rain fell, but December was dry in comparison. Exceptionally heavy rain fell during the first three months of 1928, ranging from 3 to 6 inches during February. Much of the rain occurred in heavy storms, which caused serious washing away of the fallows in undulating country. This seriously affected the subsequent crops. The copious summer rains caused a heavy growth of stink grass (*Eragrostis major*) practically throughout the central west. It was impossible in many cases to control the grass, which grew in a luxuriant mass, in many instances fence high. It became necessary to disc and often times re-plough in March to restore the fallow to anything like

condition. The poor results obtained from the wheat crop were in many cases due to the heavy growth of this grass on the fallows.

In April and May ideal weather conditions prevailed for sowing, and the ground was generally in excellent condition. Germination was very good and took place quickly, and the early growth was very fast. By the end of May sowing was practically completed, even of early maturing varieties, but as the season finished correspondingly early no harm resulted from some unseasonable sowing. The winter months were excellent, with light rainfall, mild conditions, and few frosts, and at the end of winter crops generally were in an excellent condition, except for leaf rust, which was very prevalent. The springs months were dry and unusually hot, causing the crops to ripen exceptionally fast and the grain to pinch somewhat.

Stem rust made its appearance during October, and the worst visitation for many years was experienced, very considerably reducing the yield in some districts, particularly in the Cowra district, where the spring rains were heaviest. The weather during harvesting was perfect, the grain being harvested without rain falling, and a good heavy-weighing sample of excellent colour resulted.

RAINFALL on Fallows and During Growing Period.

	Grenfell.	Cowra.	Canowindra and Cranbury.	Eugowra.	Molong.	Ooma.
	inches.	inches.	inches.	inches.	inches.	inches.
Fallow period (1st July, 1927, to 31st March, 1928)	22·05	19·96	20·83	19·50	23·21	19·04
Effective growing period–						
April	2·80	2·25	2·01	1·32	1·89	3·10
May	1·12	·64	1·05	·85	·61	·90
June...	1·15	1·44	1·76	1·52	1·26	1·32
July	2·43	2·35	2·18	2·48	2·30	1·80
August	·99	·72	·26	·67	·35	·76
September	·92	·31	·48	·59	.27	·60
October	·50	1·68	1·33	1·69	1·52	1·04
November (to 4th only)	·46	·88	1·08	·66	·78	·84
Total	10·37	10·27	10·15	9·78	8·98	10·36
Grand Total ...	32·42	30·23	30·98	29·28	32·19	30 00

Points Awarded Winning Crops.

The winning competitors and the total of their award points in each competition were:—

FALLOW and Crop Competition.

Society.	Competitor.	Variety.	Crop.	Fallow.	Total.
			Points.	Points.	Points.
Cowra	F. C. Rowlands and Sons ...	Waratah ...	144.	143	287

The council of the South-western Show Association has presented a cup for the winner over three years in this competition. It is in its second year, and Messrs. F. C. Rowlands and Sons have the substantial margin of 14 points over any other competitor in this division.

CROP Competitions (P. and A. Associations).

Society.	Competition.	Variety.	Award Points.
Grenfell ...	... Hampton Bros.	... Waratah	135
Cowra ...	... F. C. Rowlands and Sons ...	... Waratah	144
Eugowra ...	... O'Neil and Bowen	... Waratah and Bena ...	136
Canowindra	... A. H. and H. Goodacre ...	... Turvey	136½
Molong ...	... G. E. Bradley and Sons ...	... Turvey	131

CROP Competitions (Agricultural Bureau Branches).

Branch.	Competitor.	Variety.	Award. Points.
Cranbury	H. H. McDonald	Bena	132½
Ooma	R. Neville	Waratah	137½

CROP Competitions (Holdings under 640 acres).

Society.	Competitor.	Variety.	Award Points.
Cowra	J. Norrie	Yandilla King, Turvey.	134

Details of Winning Blocks.

F. C. Rowlands and Sons (Waugoola).—With a block of Waratah, this competitor won the Cowra P. and A. Association's crop and fallow competition and crop competition for the Henley Cup, and was runner-up in the R.A.S. Championship for the central south-western division of the State. By winning three times, the Henley Cup now becomes the property of Messrs. F. C. Rowlands and Sons, who won it from Mr. J. T. Freebairn, who also had two wins to his credit, and came second in this year's competition.

The block of Waratah was sown on an ideal fallow—winner in the Cowra P. and A. Association's fallow competition—which had been commenced by mouldboard ploughing in August. It was harrowed in November, springtoothed in December, disced in January, springtoothed end of February and prior to sowing. All these workings were with tractor-drawn implements. The crop was not fed off. It was sown with 66 lb. graded seed which had been treated with copper carbonate and 85 lb. superphosphate on 21st to 26th May. The paddock had been thirty years under crop, and was a light red loam originally timbered with yellow box.

This was a beautiful crop, extremely dense and even, of excellent type and purity, and in splendid condition. Disease attack was very light, a little rust and a trace of flag smut and bunt being present. A few black

oats were the only noticeable weed growth. The crop was estimated to yield 40 bushels. Owing to the excellent fallow it finished in excellent condition despite the lack of rain. The rainfall on the fallow was 22.08 inches and on the growing crop 9.83 inches.

Hampton Bros. (Grenfell).—This competitor won the Grenfell P. and A. Association's competition with a block of Waratah on a fallow commenced with mouldboard ploughing in June-July, 1927. It was harrowed three times before harvest; rigid-tined November, January, and harrowed, rigid-tined, and harrowed between then and sowing in last week of May, using 70 lb. seed and 70 lb. superphosphate. This was a dense block, estimated to yield 35 bushels, and it was reasonably free from disease and of good type. Although an excellent commercial block, it was hardly up to championship standard.

A. H. and H. Goodacre (Canowindra).—This crop of Turvey, winner of the Canowindra P. and A. Association's competition, was sown in the second week of April with 60 lb. seed and superphosphate on July fallow, which had

Winning Crop, Cowra P.A. and H. Association's Competition (Henley Cup).

This crop of Waratah was entered by Messrs. F. C. Rowlands and Sons, "Werribee," Wongalea. It gained second place in the R.A.S. Championship Field Wheat Competition for the Central South-west Wheat Area. Estimated yield, 40 bushels per acre.

been harrowed and disced in November, harrowed and combined in February, harrowed in March and again prior to sowing. It was a very dense block, in excellent ripening condition, clean, and except for flying smut reasonably disease-free. It was estimated to yield 35 bushels per acre.

O'Neill and Bowen (Murga).—This entry of 34 acres of Waratah and 16 acres of Bena won the Eugowra P. and A. Association's competition. The Waratah was a particularly fine crop. Sown first week in May with 55 lb. seed and 65 lb. superphosphate. The fallow was commenced in early September with a disc ploughing 6 inches deep, disced end of February, and sown with combine. The crop was of excellent type and purity, even and dense, and in good condition. A few oats marred the appearance. The estimated yield was 35 bushels.

G. E. Bradley and Sons (Pinecliffe).—This block of Turvey won the Molong P. and A. Association's competition in a small field. The fallow

was commenced with the sundercut in June; the same implement was used again in November; combined end of January, February, and March; sown with combine first week in April, using 60 lb. seed and superphosphate per acre. The crop was outstanding as regards purity, and although not dense, was even, in good condition, clean, and disease-free. It was estimated to yield 30 bushels per acre.

The Varieties.

The number of different varieties judged was the same as last year, viz., seventeen. The order of their popularity and those occupying winning positions in the nine competitions are indicated in the following table:—

Variety.	Total Entries.	First Place.	Second Place.	Third. Place
Waratah	44	4½	4	4
Yandilla King ...	22	½	2	3
Bena	15	1½	2	½
Turvey	13	2½	1	...
Penny	7½	...	...	½
Marshall's No. 3 ...	7	...	...	1
Canberra	2	...	...	...
Union	1½	...	...	...
Federation	1	...	...	...
Nabawa	1	...	...	...
Other Varieties ...	6	...	...	...

Taking the total number of entries of each variety, and computing the percentage of placings, we arrive at the following interesting comparison:— Waratah 28.4 per cent., Turvey 27 per cent., Bena 26.6 per cent., Yandilla King 25 per cent., Marshall's No. 3 14.3 per cent., Penny 6.6 per cent., other varieties nil. It is evident that the popularity of Waratah is well maintained, and the results generally would indicate that confidence in it is well justified. Since it made its appearance in crop competitions its success has been phenomenal. Each season in the last four or five it has had to demonstrate its yielding ability under some adverse condition. Last season it showed its ability to withstand a dry time almost up till flowering stage, when other varieties practically perished, and to respond marvellously to late rains. The previous season, with its dry "finish," found Waratah well to the fore, although "hayed in" a little, and this season it has chiefly shown its rust-escaping characteristic, which enabled it to fill the grain and yield well as compared with other varieties which almost failed.

Turvey, although not so popular as Yandilla King, scored better in these competitions. The former is very popular in the Canowindra and Molong districts, while the latter is largely grown in the Grenfell (particularly towards Young) and Cowra districts.

Bena gave promise early in the season of giving exceptional yields, but once stem rust appeared its death knell was sounded. It secured several "places," but only in localities where rust was not very bad.

Penny is a popular variety in the Grenfell district, where it certainly has justified itself over a number of years for early sowing.

Union was particularly bad with stem rust this year. Like its parent, Federation, it has shown its susceptibility to all diseases, and is more suitable for drier districts.

Seed Treatment for Bunt.

Of the 120 blocks judged, 115 were treated with dry copper carbonate, three were bluestoned, one formalin treated, and one untreated. Bunt was bad in the untreated block, medium-bad in one bluestoned, and a trace in three of the copper carbonate treated blocks. The last-named may have been due to insufficient dusting. The results were highly satisfactory as far as the dry treatment is concerned, and the fact that 96 per cent. used this method shows its popularity with wheatgrowers.

Winning Crop, Canowindra P. and A. Association's Competition.
This crop of Turvey, estimated to yield 85 bushels per acre, was entered by Messrs. A. H. and H. Goodacre, "Felton," Canowindra.

Trueness to Type, Rate of Seeding, &c.

The points awarded in each district for trueness to type and purity gave the following averages:—Grenfell 18.5, Cowra 18.7, Canowindra 18.0, Cranbury 18.2, Molong 18.5, Eugowra 17.8, and Ooma 17.7 These averages are very close to last year's figures, although Eugowra was not so good.

It is only since crop competitions have been conducted that farmers have been alive to the importance of sowing seed free from impurities and of true type. While it is difficult, at harvest time in particultar, to keep seed pure, a little time and patience are well repaid by crops that mature evenly.

RATES of Seeding and Manuring.

——	Grenfell.	Cowra.	Eugowra.	Canowindra.	Cranbury.	Molong.	Ooma.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Seed per acre ...	61·0	63·4	59·4	62·8	63·3	59·7	53·1
Superphosphate per acre	64·5	65·0	52·5	61·2	61·3	54·0	60·0

In the Cowra competitions the seed and superphosphate applied was 5 lb. above the average of the previous year. At other centres it was slightly lower. This was, no doubt, due to the ideal conditions at seeding time, when

a little less seed seemed advisable. Numerous experiments to determine the most economical amount of superphosphate to apply are being conducted in all these districts, and over the last three years the indications are that the amount of superphosphate can be substantially increased over the above averages. The winning blocks in the crop competitions are usually heavily "supered"; for example, the highest scoring block in all the present competitions, that of F. C. Rowlands and Sons, Cowra, received 85 lb. superphosphate per acre.

Cultivation Methods.

An analysis of the methods adopted by the twenty-five blocks occupying winning positions is of interest. It shows the average number of times the fallow was worked, exclusive of ploughing and drilling, was 5.32. Owing to the dry winter and spring of 1927, the ground was too dry to break up with the mouldboard plough, and the disc plough was employed much more than usual. In these winning blocks, ten were disc ploughed, nine mouldboard ploughed, four commenced with disc cultivation, and two with the springtooth. The time of commencing the initial ploughing of the fallows was:—Two commenced in March, two in May, three in June, five in July, six in August, six in September, and one in October.

The number of times the fallow was cultivated on the block placed first in each competition is given in the following table, which also gives the time of commencement of the fallow:

Competition.	Fallow Commenced.	No. of Cultivations.
Cowra (Henley Cup, and Fallow and Crop Competition).	August	5
Cowra (640-acre Competition)	September	6
Grenfell Crop Competition	June	8
Canowindra Crop Competition	July	7
Eugowra Crop Competition	September	2
Molong Crop Competition	June	5
Cranbury Bureau Crop Competition	August	5
Ooma Bureau Crop Competition	September	5

The above figures afford some indication of the methods adopted by the winners. The number of times the fallow was worked was not excessive, and in some cases apparently reduced to a minimum. Actually the number of times worked is not of particular importance. Working for no particular reason is not advisable, and a farmer must be guided by the condition of the mulch, compactness of the sub-surface soil, the amount of weed growth, and rainfall as to the time of cultivation and the implement to employ. Continuous rain, which destroys the mulch, favours weed growth, which may necessitate numerous cultivations, while in a dry summer the fallow is better left alone until rain falls.

Diseases.

The most prevalent diseases this year were leaf and stem rust and flag smut. The latter, speaking generally, was the lightest in its attack for a number of years. Although odd badly-affected areas were met with, the

loss throughout the central west this season was negligible. Leaf rust made its appearance at an exceptionally early stage, the leaf showing the disease and also exhibiting a yellowish appearance, the result of an attack when less than 6 inches high. Early spring weather and some very strong hot winds with dry weather in August and September gave promise of doing much to arrest a threatened attack of stem rust. October had a rainfall of from ½ to 2½ inches, and in those centres where the fall was heaviest stem rust made its appearance and considerably reduced the yield. The loss due to stem rust was considerable in the Cowra district, and very little less at Canowindra. The western portion of the Grenfell district did not suffer, but towards Young and Greenethorpe the yield in the case of

Winning Crop, Eugowra P. and A. Association's Competition.

This crop of Waratah was estimated to yield 35 bushels per acre. It was entered by Messrs. O'Neill and Bowen, "Yarrangah," Murga.

some varieties was much reduced. In practically every centre stem rust was present, and much of the pinched grain harvested was due to this disease. In the Cowra district, however, crops were seen dense enough to yield 12 or 13 bags, but which, owing to stem rust, would not yield more than 6 or 7 bags.

Yields.

The estimated yields in the various competitions this season were high, as shown in the following table, in which a comparison is also made of "placed" and "unplaced" blocks:—

Society.	Average Yields of Competition.	Average Yields of three Winning Crops.	Average Yields of Unplaced Crops.
	bushels.	bushels.	bushels.
Cowra (Henley Cup) ...	31·4	35·7	30·7
Cowra (640-acre Competition).	30·5	31·7	29·5
Grenfell	30·9	34·7	30·4
Canowindra	31·1	36·0	30·3
Eugowra	30·8	33·3	29·2
Molong	27·5	30·0	25·0
Cranbury Bureau... ...	27·8	29·3	27·2
Ooma Bureau	25·7	32·3	24·0

Riverina District.

G. C. BARTLETT, H.D.A., Agricultural Instructor.

Five competitions were judged in the southern and south-western Riverina, embracing the following districts. These were carried out under the auspices of the Lockhart P. and A. Society, Oaklands F. and S. Society, Brookdale F. and S. Society, Corowa P. and A. Society, and Albury P. and A. Society.

Lockhart conducted a combined fallow and crop competition, commencing with sixteen entries. Four of these later withdrew, but an open competition was also held, and this attracted eighteen more entries. making a total of thirty as against sixteen last year. Brookdale open competition of five entries was taken in conjunction with these, but is not included in the above. Oaklands adhered to a combined fallow and crop competition, commencing with twenty-nine entries, of which only two withdrew, leaving twenty-seven to be judged—a very creditable showing, and one that speaks well for the interest taken in the competition. It is well worth mentioning that this is quite a new district as far as competitions are concerned, and four years ago the fallows in this district only scored very few points, whereas this year sixteen of the twenty-nine could be classed as first-class fallows, scoring between 138 and 143 points.

Corowa entries have fallen off of late, and this is a situation that requires attention. The society adhered solely to a combined fallow and crop competition. There were twelve entries in the fallow, but three withdrew later, leaving nine crops to be judged. I would suggest that the society also hold an open competition to allow those to enter who possess a good crop that is on fallow but which has not entered in the combined competition. It sometimes happens that the crop, for some reason or another, turns out disappointing, and the farmer withdraws from the competition, but he may have a good crop on another fallow that was not entered. I would also like to point out to farmers that their main aim in taking part in these competitions should be to benefit from the lessons they teach, rather than with the one idea of having the crop that wins the prize money and the cup. Several instances have been met where farmers have increased the farm average yields by 6 to 10 bushels per acre through following up practices demonstrated by these competitions.

Albury P. and A. Society conducted an open crop competition having sixteen entries.

Details of the cultural methods adopted by the winning competitors were published last month in the Riverina championship report.

Soils.

The soils around Lockhart, Galore, and The Rock are mostly of a good red loamy nature, friable and fairly easy to work, but on the plains they quickly change to heavy mixed soils that are difficult to work.

In the Oaklands district they are of a very mixed nature, quickly changing. Good red loams, very light sandy loams, and heavy mixed plain types are all met within a few miles.

The soils of the Corowa and Albury districts are mostly of a grey to dark brown heavy loam, inclined to be silty. They run together readily and set when worked with the disc or when harrowed too much. Between the two centres, in the Brocklesby district, they become more of the red loam type with more body, and are fairly easy to handle.

Seasonal Conditions.

The seasonal conditions have been most abnormal following on one of the driest seasons for a long time. A wet tropical autumn made the working of the fallows a problem, and caused considerable trouble due to severe washouts in the hilly districts and in other cases flattening and caking the surface and promoting a prolific weed growth. Most of the fallows were put in very fair order again, and in consequence of the abundant moisture conditions were excellent for seeding. Except for a few patchy strikes on mixed country the germination was all that could be desired, and in the early winter prospects indicated a record season. The country underwent a great change during the winter, which quickly set in dry, with many severe and heavy frosts. It remained dry until well into October, and from the beginning of September onwards the crops, with the exception of those in the Albury district, rapidly commenced to go off. In the Lockhart district good falls of rain were received early in October, and the crops picked up rapidly and finished much better than expected. The Corowa and Oaklands districts missed most of these rains, and in these districts there were many crops of the Federation types of wheat which ripened while hardly out of the flag, and contained many large areas of burnt-off patches. This was especially so on the heavy mixed plain. A notable feature about the rainfall was that, although the monthly totals appear very fair, most of the winter and spring rain fell in dribs and drabs of a few points at a time, accompanied or followed by high winds, which had a very drying effect. Most of the Riverina experienced three months of high winds.

The following table gives the rainfall on the fallows and on the crops in the various districts:—

RAINFALL.

—	Lockhart.	Oaklands.	Corowa.	— —	Lockhart.	Oaklands.	Corowa.
1927—				1928—			
July ...	157	149	152	March ...	244	310	467
August ...	168	159	239	April ...	120	108	107
September ...	90	107	93	May ...	101	119	124
October ...	359	271	317	June ...	89	125	169
November ...	25	58	38	July ...	161	102	200
December ...	13	36	30	August ...	26	44	41
1928—				September ...	78	58	99
January ...	243	258	275	October ...	289	152	274
February ...	412	285	561	November ...	20	Nil.	4

Cultivation.

Earlier ploughing is rapidly coming into prominence, and nearly all the winning crops in each district this season were ploughed in either June or July, and worked five, six, and seven times. At Lockhart the average number of workings was five, at Oaklands five, Corowa five, Albury three and a half, and Brookdale four. The springtooth cultivator is still doing excellent work, and this was the implement used by most of the competitors, but it was noticed that more farmers are now using the wide 6-inch points on this implement. The combine is going out of favour for working the fallow, because, although an excellent implement for sowing, it is now recognised that the combine does not make a good job of the fallows if they are at all out of condition. In this respect an implement that is now rapidly gaining favour is the rigid-tine duck-foot scarifier, and many paddocks are now being worked up with this implement prior to sowing with the hoe drill. The scarifier did especially good work in rectifying the condition of the fallows after last autumn rains; in fact, in several places where a scarifier was not available the disc had to be used, but in no case where a scarifier was on the farm had a disc to be used.

The average number of workings is decidedly on the increase. This, together with the earlier ploughing and handling of smaller areas, is largely responsible for producing such excellent crops under the very adverse conditions that have been experienced these last two seasons. It is interesting to note that, despite the deprecatory remarks that have been made in the past about the use of the disc, the best crop in the Corowa competition and the second crop in the Oaklands competition were on fallow that had been disced. It is as well to point out that one often obtains results such as these in abnormal seasons. There was no scarifier available, and there was such a prolific growth of weeds that the lesser of the two evils was the disc. Moreover, the seasonal rains of the autumn counteracted a good deal of the deleterious effect of this implement, and gave the crop a good start. A most important point to note is that in both these cases the working with the disc was immediately followed by a springtooth cultivation. And the fact must not be lost sight of that there was no comparison available, as in Coolamon district last year, when the disc-worked half of one paddock gave just 2 bags less than the scarifier-worked portion.

A few blocks were summer fallowed with excellent results, and there was a distinct decrease in the amount of wild oats in these cases, but as yet the practice of summer fallowing is not nearly so widespread as it might be. It is not practicable to summer fallow the whole of the farm, but at least a portion, say one-third, should be done each season; in fact, it is now becoming almost essential on some farms for the eradication of fungous diseases and weeds.

Seeding and Manuring.

The amount of seed and manure applied has been steadily on the increase, but has now settled down to a more steady mark, and there is not so much variation in the amounts applied in the various districts as last year.

The tendency this season in some cases has been to sow on the heavy side. Overseeding is not a wise practice, especially with fair stooling varieties like the Federation types and Yandilla King. The plants are overcrowded, resulting in weak stalks that lodge easily, and the plants in all probability will bear small heads. It also renders the crop more susceptible to fungous blights, such as black winter blight (*Septoria*) and rust, which further weaken the plant. If sown in season, and with less seed, these varieties stool freely and develop healthy, strong stalks. Most of the worst burning of this season occurred in the heavily seeded crops. The competitions very definitely established the above points. Sowing at the rate of 60 to 65 lb. of seed of the late maturing varieties and 70 to 75 lb. seed of the earlier maturing varieties gave the best results.

The average quantity of seed sown in the Lockhart competition was 68 lb., Oaklands 75 lb., Corowa 68 lb., Albury 71 lb., and Brookdale 71 lb.

Over-manuring also gave disappointing results. Up to the middle of September the heaviest manured crops looked decidedly the best, but from then on they commenced to burn off rapidly. It was found that, under average conditions, 80 to 90 lb. superphosphate gave the best results.

The average amount of superphosphate applied was 79½ lb. at Lockhart, 80 lb. at Oaklands, 82 lb. at Corowa, 77 lb. at Albury, and 81 lb. at Brookdale.

Many crops were sown on the late side, especially the Federation types, and these burnt off badly. All the early-sown crops stood out.

Pickling for Bunt Prevention.

The fact that, of the eighty-seven entries judged, seventy-six were dry pickled speaks for itself. No bunt was seen in the dry-pickled crops, but a little was noticed in those treated with bluestone. Six crops were treated with bluestone, one with formalin, and particulars were not available in regard to four others.

Weeds and Diseases.

The competition crops were very clean and, on the whole, free from oats and thistles. Parts of Albury, Corowa, and Lockhart districts are infested with saffron thistle, and the cleanliness of the crops reflected great credit on the farming methods, and showed that the saffron was, with modern methods, comparatively easily dealt with if farmers liked to take the trouble.

The district was comparatively free from diseases of a serious nature. A little foot-rot was general, but mostly in a small way, as also was loose smut. Flag smut was in evidence, but mostly in small quantities, and very little take-all was seen. Rust and septoria, or black winter blight, were very prevalent during the winter, but this was general all over the district, and was responsible for a good deal of the "yellowing off" in the winter which was attributed to the frosts. This, no doubt, weakened the crop somewhat, and it was found that in certain cases this caused many crops to feel the effects of the dry weather later on to a greater degree, and was worst in the late-sown crops. These are seasonal fungi, and not much can be done as regards control, except to avoid over-seeding and to sow varieties not so

liable to attack. Most of the crops outgrew the effects of these fungi to a large extent, but in the eastern Riverina, especially the Albury district, the stem rust developed considerably, and a good deal of pinching of the grain resulted, and in some cases large sections of the crops contained many empty heads. The worst attack of stem rust manifested itself in the form of a collar ½ to ¾ inch wide round the stem, under the covering of the top leaf sheath.

In the Lockhart and Oaklands districts large burnt-off patches occurred on the heavy mixed plain country, and many plants in these patches exhibited symptoms of foot-rot. Drying-off conditions accentuated the trouble. Similar conditions were also found in other crops of Yandilla King, which had been sown late and were showing the effects of dry weather. Farmers are advised to take no risks where these symptoms occur, and are advised to treat as in the case of foot-rot. Most farmers now recognise foot-rot and flag smut, and in individual paddocks where these are seen to a large extent a good early burn and spelling the land from wheat by rotating with oats are advised.

Varieties.

Yandilla King, Marshall's No. 3, and Waratah again occupied prominent positions, and, on the whole, were the best varieties. Bena, Union, and Gallipoli also did well, but Gallipoli shows a distinct susceptibility to rust and blight. Waratah was rather light, but produced good average crops, and was healthy and comparatively free from rust.

The following table shows the number of times the different varieties were placed in the competitions:—

Variety.	No. of Entries.	First Place.	Second Place.	Third Place.
Waratah	15	...	2	1
Yandilla King	19	2	...	...
Marshall's No. 3	8	1	1	2
Bena	8	2	1	...
Nabawa	5	1	...	...
Union	6	...	...	...
Federation	13	...	...	...
Wandilla	4	...	...	...
Turvey	7	...	...	1
Gallipoli	3	1	...	1
Bomen	2	...	1	1
Graham	1	...	...	...
Canberra	2	...	...	...
Nizam	2	...	...	...
Major	1	...	...	...
Penny	1	...	...	...
College Purple	1	...	...	...

The average yield of all competition plots was 27 bushels per acre at Lockhart, 22 bushels at Oaklands, 27 bushels at Corowa, 33 bushels at Albury, and 25 bushels at Brookdale.

A noteworthy feature of the competitions was the vast improvement in type and purity of seed that has been made in recent years. Lockhart was again to the fore in this respect. Twenty-four of the thirty-four entries judged were up to pure seed standard.

As indicating the standard of the crops in the different districts, the average number of points scored is interesting. Albury averaged 131 points, Corowa 125, Lockhart 123, Brookdale 122, and Oaklands 119½.

Further Riverina Centres.

H. J. DARGIN, Agricultural Instructor.

Crop competitions were also conducted by the local agricultural societies at Narrandera, Berrigan, and Deniliquin.

The Season.

The extreme western portion of the Riverina again experienced droughty conditions, the season being even drier than was the case last year when the crops made an excellent recovery after heavy rains in late September and early October. This year the farmers were not so fortunate as to have even such a late fall of rain to better their conditions, with the result that the standard of crops exhibited throughout the Narrandera and Berrigan districts was lower than that of last year. Conditions were also decidedly bad at Deniliquin, where the first wheat-growing competition ever held in that district was organised by the Farmers and Settlers' Association. The intense interest displayed throughout this wheat-growing centre in the efforts of the Farmers and Settlers' Association and the Department of Agriculture to promote better farming methods in the locality by means of these educational competitions was a pleasing feature.

Cultural Details.

The fallows were in good condition generally at time of sowing, and a splendid germination resulted, but unfortunately the rainfall throughout each district varied considerably during the growing period of the crops, more especially at Narrandera where the entries were scattered over a large area, 4½ to 7½ inches being recorded. At Deniliquin, most of the crops were grown with a rainfall of only 5½ inches, while at Berrigan 7 to 7½ inches fell on the growing crops. In these three districts most of the rain fell in scattered showers, and at times when it was of little use to the growing crops. Under such conditions heavy yields and well-grown competition crops could not be expected.

Early ploughing in June and July was adopted by the majority of farmers. The early preparation of the land is rapidly gaining favour throughout the Riverina; seven of the nine placed crops in the competitions were ploughed during these months. Considerably more mouldboard ploughs were used than disc ploughs in the Narrandera and Berrigan

districts. At Deniliquin altogether too many disc implements are being used, with the result that some of the seed-beds were not in the best condition, the soil having been pulverised, while in many cases a considerable time elapsed between the falls of rain and the working of the fallows. A large amount of soil moisture must have been lost through this delay in cultivating.

Attention must be paid to providing a suitable mulch throughout the fallowing period as a means of conserving moisture and improving the fertility by promoting aeration and bacterial activity if these farmers wish to obtain the best results from their land. The average number of times the fallows were worked in the three districts was six, while several received nine and ten workings, and in every instance sheep had been used to assist in keeping the fallow free from weed growth.

The number of crops judged were: Narrandera, 18; Berrigan, 21; Deniliquin, 19; total, 58; there being sixteen different varieties included in the total of fifty-eight crops inspected. Federation was easily the most popular variety with twenty-eight entries, there being no less than fourteen and a half of this variety out of a total of nineteen crops judged at Deniliquin. There were only five entries of Waratah, which was the most popular variety in many parts of the Riverina last year, when it almost trebled the number of entries of any other variety in the five competitions judged. Its loss of popularity was due to its strong tendency to shell, and the manner in which the fine straw tangled in places where it grew tall.

The following table shows the relative popularity of the varieties, and their success in the crop-growing competitions:—

Variety.	Total Entries.	First Place.	Second Place.	Third Place.
Federation	28	1	2	1
Yandilla King	3½	1	...	...
Penny	5	1	...	...
Union	3½	...	1	...
Turvey	2	...	...	1
Nabawa	2	...	...	1
Waratah	4½	...	...	...
Canberra	2	...	...	...
Graham	1	...	...	...
Nizam	1	...	...	...
Bower	1	...	...	...
H.F.S. Imperial	1½	...	...	...
Rajah	1½	...	...	...
Bald Early	½	...	...	...
Major	½	...	...	...
Pusa	½	...	...	...

Seed Treatment and Rate of Seeding.

The dry copper carbonate method of treating seed wheat for the prevention of bunt was mostly in favour in the various districts. Of a total of fifty-eight crops inspected, fifty-three received the dry treatment, three were treated with bluestone, one with formalin, and one was untreated.

The quantities of seed sown per acre in the three districts judged were as follows:—

District.	45 lb.	50–56 lb.	60–65 lb.	70–75 lb.	80 lb.	No. of Entries.
	per acre.	per acre.	per acre.	per acre.	per acre.	
Narrandera ...	...	...	12	6	...	18
Berrigan	1	3	10	6	1	21
Deniliquin ...	...	1	15	3	...	19
Total ...	1	4	37	15	1	58

The seed sown had been graded with but two exceptions, both of which were in the Deniliquin district. Of the nine placed crops in the competitions, four were sown at the rate of 70 to 75 lb. of seed per acre, two at 65 lb. per acre and three at 60 lb. per acre.

As was the case last year many of the crops inspected showed too many strangers in them, and much of the seed was running out. No doubt this was brought about by the fact that most of the farmers were compelled to sow the same seed again on account of not being able to procure suitable seed wheat locally after last year's very lean season.

Superphosphate.

The following table shows the quantities of superphosphate applied per acre to all crops in the three districts visited:—

District.	50–56 lb.	60–65 lb.	70–75 lb.	80-85 lb.	90 lb.	112 lb.	No. of Entries.
Narrandera	1	8	4	3	...	2	18
Berrigan	2	10	2	6	1	...	21
Deniliquin	1	10	5	2	1	...	19
Total ...	4	28	11	11	2	2	58

Approximately 50 per cent. of farmers applied 70 lb. superphosphate per acre and upwards, this being slightly less than was applied last season. Only four crops received applications of 56 lb. or less per acre.

Diseases and Weeds.

Several of the crops judged were slightly infected with take-all and foot-rot, but not a trace of bunt was observed in any of them. Flag smut and loose smut were very much in evidence.

Deniliquin crops, which were nearly all of Federation variety (fourteen and a half out of nineteen entries were of this variety), were generally badly infected with flag smut. Federation is a great favourite in this district on account of its bag-filling qualities, and also due to the fact that it does not grow tall enough to be damaged to any great extent by the severe windstorms which occur in this district towards the end of the growing

period, mainly during the months of October and November. Unfortunately, Federation is not disease resistant, with the result that through sowing it year after year on the same land during seasons which have been favourable to the development of fungous disease, the wheat fields have become badly infected with the spores of the flag smut fungus, which played such havoc with the crops this season.

The farmers in this district should give a great deal of consideration to obtaining pure uninfected graded seed, and varieties showing disease resistant qualities, such as Nabawa, Wandilla, Riverina, and Rajah. A striking example of the resistance of Rajah was seen at Deniliquin during the judging, when a crop of Rajah, grown on infected land between crops of Waratah and Federation, was substituted for Federation because of the prevalence of flag smut in the latter. Both the Waratah and Federation were badly infected. After a thorough search only one flag smut affected plant was found in the Rajah. This plant was affected to such an extent as to be unrecognisable, and may possibly have been a stranger.

Farmers in this locality should give attention to burning off stubble, long fallowing, the best methods of working the fallow, and the rotation of crops.

Stem rust was also prevalent in all districts this year, but did not appear to affect the yields as it developed very late in the season.

Wild oats and saffron thistle were seen in large quantities in many crops grown on old cultivation paddocks. Wild mustard has also gained a firm hold on a number of properties, while skeleton weed affected the yield on one property.

To Increase the Consumption of Milk.

The Minister for Public Health (Dr. Arthur), with the co-operation of all sections of the milk industry, has initiated a campaign to increase materially the consumption of fresh milk. If successful, this will greatly benefit the entire community. It will help the producer to dispose of his milk more profitably; it will cheapen the cost of transport—and, it is hoped, ultimately enable the cost of milk to be reduced; above all, it will raise the standard of physical health and well-being, especially among children.

A strong committee, representing the producers, the distributing companies and the retail vendors, has been constituted, under the chairmanship of Dr. Arthur, and during March a "Milk Week" will be held, when efforts will be made to concentrate public attention on the superior food value of milk as compared with other foods.

To assist in this direction, a leaflet on the production, distribution, and value of milk is being compiled and will be forwarded to all who may desire it, at an early date. Booklets on "Milk" are being compiled and will be distributed through the schools, the Baby Health Centres, and other avenues, during the "Week." A suitable poster is being issued and will be displayed on ferry boats, on railway stations, in tram cars, in shop windows, &c., stickers will be issued, and radio talks will be given by doctors and others.

Free milk, to be donated by the milk companies, will be distributed at several city and suburban schools.

Green Colouration in Wool.

H. R. SEDDON, D.V.Sc., and T. T. McGRATH, M.R.C.V.S.*

THOUGH distinctly uncommon, it is not a very rare thing to see wool which shows a greenish discolouration, and at times a reddish colouration has been observed. The discolouration may affect the whole length of the staple or only part, and sometimes may occur as bands across the staple. It is said to be most commonly met with in wool from the tablelands, and it is understood that the wool is looked upon unfavourably by buyers owing to the colour remaining steadfast after scouring.

Recently a sample from the Monaro district was submitted to Glenfield Veterinary Research Station for examination, and as a result it was possible to confirm an observation made by one of us (H.R.S.) in Victoria some years ago, that the production of colour was due to the growth of a pigment producing bacterium. Not only was the bacterium readily cultivated from the sample in question, but the condition has been reproduced experimentally on the back of sheep.

It was found that the bacterium in question requires a considerable amount of moisture for its growth, and appears to grow better on fine than on coarse wool. When very old the colour turns a brownish red, but the green colour can be restored by the addition of alkali, and, conversely, the green colour becomes red on the addition of acid. It would thus appear that if there happens to be an acid-producing organism, the wool may take on a red colour. Thus both types of discolouration may be induced by the growth of the same organism.

The green-producing bacterium is not a very uncommon organism, and at times gets into wounds, probably from dust. It would seem, therefore, that if it gets a lodgment on the skin of a sheep and the conditions are suitable for its growth, *i.e.*, if the skin is scurfy and there is sufficient moisture, it may lead to this discolouration of the wool. Such conditions might well exist at times in tableland country with a heavy rainfall, and it is to be noted that it is said that the condition is seen chiefly in sheep from such localities.

The Veterinary Research Station would be glad to receive further specimens of this or similarly coloured wool, particularly if accompanied by information as to the part of the sheep affected and the state of the skin, in order that further observations may be made on the condition.

* An account of investigations carried out at Glenfield Veterinary Research Station.

THE great aim of all animal husbandry is increased production, and this again depends almost entirely on the feeding of stock. Any errors in feeding will cause malnutrition and disease.

The Production of Cauliflower Seed.

J. DOUGLASS, H.D.A., H.D.D, Agricultural Instructor.

THE cauliflower is one of the most popular vegetables placed on the New South Wales market, and the average price realised by growers over a number of years compares more than favourably with that returned by perhaps any other vegetable crop.

Cauliflower growing demands close attention to detail as regards cultural methods, while climatic conditions also play a very important part. As in the case of early tomatoes, the growing of cauliflowers is a specialised undertaking, and the grower who studies the subject and grows the crop year after year will obtain the best results.

The Importance of Good Seed.

The factor which perhaps makes for greatest success in the growing of cauliflowers under ordinary conditions is the seed. All growers, especially those who do not raise their own seed, have experienced failure at one time or another, due to no other cause than unsuitable seed. Inexperienced growers are unable to decide what variety to grow or where to obtain good seed. The saving of a few shillings when purchasing seed is false economy. It is much better to buy the best seed and endeavour to raise each seedling in the proper manner.

The experience of the Department of Agriculture and of successful growers of many years' experience has shown that correctly selected and properly raised local seed gives the most satisfactory results in a majority of cases. It is always a wise plan, however, to test out new introductions on a small scale, for in this way it is often possible to select suitable new varieties.

Having drawn attention to the importance of locally-grown seed of good quality as a factor in successful cauliflower production, the remainder of this article will be devoted to instructing growers as to how to raise their own seed. That this can be done successfully is evidenced by the fact that for a number of years past several growers on the coast, where the climate is not ideal for cauliflower production, have grown their own selections of cauliflowers, notwithstanding the poorness of the soil. It must be borne in mind, however, that unless attention is given to every phase of seed production, failure will invariably result.

The Common Method of Raising Seed.

The most common procedure in the raising of cauliflower seed is to concentrate on a few rows along the side of the field. Only the very best types should be allowed to mature with the idea of producing seed. Care should be taken to destroy plants with curds unsuitable for market; it will be found that these run to seed quickly and will readily cross-pollinate, rendering the resultant seed useless. As the cauliflower is cross-pollinated by insects, it is

advisable to have the seed plot at least half a mile from any other crop belonging to the same family of plants. In the case of different varieties this point is of no importance, if they flower at different times. The common plants belonging to the cruciferous family are cabbage, rape, swede turnip, brussels sprouts, kale, and hohl rabi.

Practical experience has demonstrated that up to three varietes can be selected on the one farm, provided they mature at different times. It is the usual practice for large growers to plant three varieties, maturing at four, five, and six months (or later), with the idea of not having all three crops coming in at the one time.

A Cauliflower Plant in Flower.

A Second Method.

Another method of raising cauliflower seed is to work through the crop, selecting the most suitable plants and then transplanting them to a convenient position. This procedure is only successful when ideal conditions are experienced at transplanting time, for even under the best conditions the plants receive a severe shock owing to their size and to the number of roots which are unavoidably injured during the transplanting.

If it is desired to make some special individual selections, the plants should be covered with mosquito netting to prevent cross-pollination by insects. Pollination of the flowers may be carried out by hand or by placing flies inside the netting cage. Bees are not as suitable as flies, as once they find themselves imprisoned in the mosquito netting they devote the whole of their attentions to trying to escape rather than to the work of pollinating the flowers. The seed from these selected plants should not be mixed, but should be planted separately in parallel rows in order to facilitate the

making of comparisons. Further selections should be made from these rows, while the majority of the plants are allowed to run to seed in order to produce a stud bulk. Rigid culling of all unsuitable types should be carried out before the plants flower. By this method of selection, improvement in type, quality, and uniformity as to date of maturing will be obtained.

Some Points in Selecting.

In the selection of the different varieties a fixed ideal must be aimed at. This necessitates a study of market requirements, quality, and defects of the various types. Attention has also to be given to varietal characteristics as well as to any noticeable variation. A working knowledge of the chief diseases and insect pests is also most valuable.

A Cauliflower Plant showing Seed Pods nearing Maturity.

In selecting individual plants in a crop for the purpose of seed production the first objective should be uniformity as regards quality, type, maturity, and disease resistance. No matter how near-perfect any individual plant appears to be, unless it is uniform as regards its main characteristics with the whole of the selected plants it should be discarded. Particular attention should be paid to date of maturity; aim always at selecting plants that mature at the same time. The selection should be made when the curd is at the right stage to cut, for if there is any delay it will be found that the curd becomes over-mature very quickly, and a false impression may be gained as to what the plant looked like when at the correct stage for harvesting. Another point is to select plants that are well covered with leaves, as these are usually of better colour and possess a greater degree of resistance to frost, rain, sun, and other mechanical injuries. The curd, or white, of the cauliflower should be perfectly white, very compact, free from

blemish, and should be well grown and developed right around underneath towards the base of the leaf. This feature not only adds to the appearance of the head, but also give a more weighty product. Curds that have noticeable defects, such as "riciness," and "fuzziness," or plants that have leaves growing up through the curd, or in cases where the curd is spreading, should be avoided. Plants with plenty of leaf, providing the curd is of sufficient size, should be given preference to sparsely-leafed plants. Discard plants showing symptoms of any disease, discolouration of the leaves, &c.

Harvest the Seed Before it Sheds.

An inexperienced grower will be disappointed more or less with the behaviour of the plants after selection. It should be remembered, however, that the selection was made when the plant was at the stage when it was most valuable commercially, and its aftergrowth, provided, of course, it is healthy, is of no importance from the point of view of selection. Soon after the plant passes the stage at which it should have been cut, it will be found that the curd becomes over-mature and opens out. The true flower then appears through the curd. After the flower has been pollinated the leaves open out widely and the outside ones die. As the pod-like seed cases grow other leaves die, until at maturity the plant is devoid of all foliage. As soon as the seeds are mature they should be taken to a barn before the pods open and shed the seed. Threshing is a simple operation, which needs no description.

Six Months' Special Giant grown under North Coast Conditions.

The plumpness of the seed is largely governed by the season and the cultural methods employed. It must be remembered that the production of seed is a heavy task for the plant, and it should, therefore, be given every assistance. When the main crop has been removed from the field, carefully cultivate, and, if necessary, irrigate the selected plants.

Guard Against Aphides.

Perhaps most damage is done by insect pests at this late stage. Aphides are likely to absorb the sap from the seed stalks and consequently prevent the normal development of the seed. Particular attention should be given to the destruction of this pest by spraying with nicotine sulphate. The cabbage moth is not of great importance in the late stages of growth of the cauliflower plant, owing to the fact that the leaves have wilted and died, and as the main plant has dried up it is not likely to prove attractive to the pest.

Dairy Farm Competition.

Murrumbidgee Pastoral and Agricultural Association.

E. O. DALGLEISH, H.D.D., Senior Dairy Instructor.

The dairy farm competition inaugurated towards the close of last year by the Murrumbidgee Pastoral and Agricultural Association was in the nature of an experiment, it being doubtful if any such competition had been held before in New South Wales. Consequently, it is recognised that there is much to be learned as to the manner in which these competitions should be conducted, method of scoring, &c.

Seven farms were submitted for judging as follows:—

H. Anderson, Rivernook, Narandera-road, Wagga.
G. W. Booth, Model Dairy, Narandera-road, Wagga.
E. J. McGrath, Wattle Vale, North Wagga.
A. R. Martin, Narooma, Urana-road, Wagga.
A. J. Condon, Kooringal, Wagga.
T. C. Smith, Sunny Pines, Alfredtown.
R. H. Stevens, Monash Vale, Tarcutta.

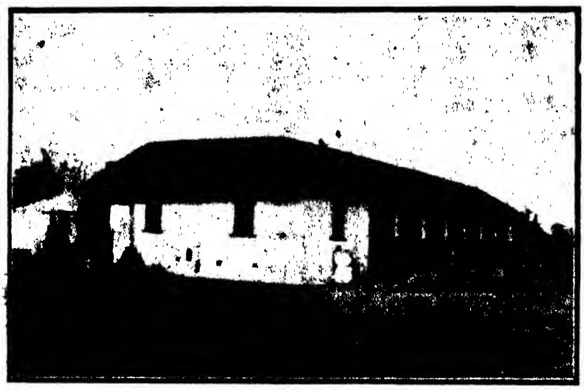
Judging occupied four days, one-half day being allotted to each farm, and the results of the judging are as shown in the accompanying table.

Results of Murrumbidgee Pastoral and Agricultural Association's Dairy Farm Competition.

Scale of Points.	Maximum Points.	A. R. Martin, "Narooma."	A. J. Condon, "Kooringal."	R. H. Stevens, "Monash Vale."	H. Anderson, "Rivernook."	E. J. McGrath, "Wattle Vale."	T. C. Smith, "Sunny Pines."	G. W. Booth, Model Dairy.
Conservation of Fodder—								
Hay, Grain and Silage	300	260	250	200	250	200	250	200
Improved Pastures	50	45	35	35	30	30	40	45
Green Crops	50	45	38	35	35	35	38	42
Herd—								
Breeding	100	90	85	80	75	80	85	80
Conformation	50	45	45	35	30	40	47	40
Type	50	45	45	35	30	40	47	40
Apparent Productiveness ...	100	90	90	85	85	90	90	90
Pure-bred Bull	100	95	85	80	75	80	90	80
Lay-out of Dairy and Farm for Economic Working—								
Bails, Yards and Dairy ...	50	40	30	35	50	45	40	30
Dairy Farm Machinery ...	50	45	30	40	48	48	40	35
Lay-out of Paddocks	50	45	40	40	45	45	40	46
Quality of Cream	50	50	50	50	50	50	50	50
Herd Testing	150	150	150	150	50	150	...	...
Piggery—								
Type of Pigs	40	30	30	30	30	...	35	...
Condition of Piggery and Pigs ...	30	20	15	20	25	...	15	...
Facility for Feeding or Grazing...	30	20	15	20	25	...	20	...
Total	1,250	,115	,033	970	933	933	927	778

The Winning Farms.

The winning farm, that of Mr. A. R. Martin, is situated on the Murrumbidgee River about 12 miles west of Wagga. About 500 acres of the total area of 1,120 acres is used in connection with the dairy, and the land varies from alluvial river flats to undulating red loam country on the higher parts. Substantial improvements in the way of fencing and subdividing have been carried out, this property being the only one visited in which special accommodation had been made for the bulls, which are not allowed to run with the herd. The farm scored highest points for conservation of fodder, there being ample reserves of oaten hay, wheaten hay, lucerne hay, and lucerne silage, providing a variety of feed. Considerable work had been done in the direction of pasture improvement by top-dressing and the sowing of grasses and clovers, while a large area, well over 100 acres, is under green crops. The farm is favourably situated in regard to growing green summer fodders, having an irrigation plant installed. The plant supplies water for the herd and dairy as well as irrigating about 30 acres of alluvial flats. The highest



Dairy Buildings on Mr. A. R. Martin's Farm.
From the absence of guttering on the roof it will be gathered that the building was not quite completed when the photograph was taken.

points of the competition were also scored by this farm for the herd, which contains twenty-six high-class stud Jerseys and many grade Jerseys of excellent type. The bull, "Monarch of Yaralla," was easily the best animal seen on the competing farms, while the cows had been selected from the studs of two of the breeders with the highest production records in the State, namely, Messrs. A. Booker, Alstonville, and H. A. McDonald, of Leeton. Mr. Martin's dairy buildings when completed will be superior to any others in the district, but they are at present incomplete and points were lost for that reason. His dairy machinery comprises practically all that is required, and the farm paddocks are well laid out for conveniently handling the herd. The farm received full points for herd-testing as Mr. Martin is a member of both the united breeders' herd-testing scheme and the local herd-testing unit.

Mr. A. J. Condon's dairy at Wagga gained second place. This farm, situated only a mile or so out of the town, is on flat lands, though well away from the river. Fodder reserves consist of stacks of oaten and wheaten

hay with one silage pit, totalling in all over 200 tons. Green crops comprise some 40 acres of Sudan grass and an area of lucerne. Pasture improvement and top-dressing have not received much attention as yet. The herd on this farm includes a fine lot of Jerseys, mainly picked heifers from the South Coast. As is usual with coastal-bred cattle, they have developed remarkably under the new pasture and climatic conditions. The herd bulls comprise one bred by Mr. H. A. McDonald, of Leeton, and one from Mr. T. Quilty, of Tumut. The bails, yards, and dairy were clean, neat and well kept, but were hardly up to the standard of other competing farms. Dairy farm machinery was not much in evidence, while the lay-out of paddocks was only fair. The farm received full points for herd-testing, but the piggery is not of a very high standard.

Third place in the competition was gained by Mr. R. H. Stevens' property, Monash Vale, Tarcutta. A farm of slightly under 500 acres, this was more in the nature of a true dairy farm than the other two leading farms, in both of which the dairy is only part of the activities of a fairly large area. Moreover, the country at Tarcutta is totally different to that on which the other farms are situated, the flat land round Wagga giving place to high hills with fertile well-watered valleys between. Stocks of conserved fodder at Monash Vale were rather low, consisting of lucerne and oaten hay only. However, the necessity for conservation here is hardly as great as on the other farms, an area of about 70 acres of low-lying swampy reed bed country providing more fodder than the stock can consume during the summer months. A larger reserve might and no doubt will be provided against the possibility of a dry winter. The herd has been built up during the four years Mr. Stevens has had this property, and is well up to the average of herds in the district, being led by a Holstein bull, "Glen Elgin's Stylish De Kol," while a young Jersey bull, bred by the Wagga Experiment Farm, is also used. Mr. Stevens, being a member of the Tarcutta herd-testing unit, gained full points for herd-testing. Bails, yards, and dairy are serviceable, clean and conveniently laid out without being elaborate.

Of the remaining entries special mention must be made of Mr. H. Anderson's farm, Rivernook, which was the only farm to gain full points for bails, yards, and dairy These gave every evidence of the most meticulous care and attention, and it would be difficult to suggest any way in which they could be improved. The standard of fencing in the yards was also higher than on any other farm inspected. Rivernook also scored the highest points of the competition for the piggery, which is placed in an almost ideal situation. However, the loss of points for herd-testing prevented this farm gaining a prize.

Mr. E. J. McGrath's farm, Wattle Vale, gained second highest points for bails, yards, and dairy, these being of a very high standard, but the fact that no pigs are kept on the farm resulted in a loss of points which proved too great a handicap. Points were also lost for fodder conservation, though the farm is so large as to make it independent of conserved supplies unless overstocked.

Sunny Pines, owned by Mr. T. C. Smith, secured second highest points for the herd, and was only a few points behind that of the winning farm, but through losing points for herd-testing the farm was unplaced, as was Mr. G. W. Booth's farm, which lost points for both piggery and herd-testing, Like Mr. McGrath, Mr. Booth disposes of all his milk through a town milk run and pigs are not kept. His farm was one of the best as regards pasture improvement and subdividing.

Proper Feeding Essential.

It was most gratifying to find fodder conservation so thoroughly practised on all the competing farms. The stock on all farms were noticed to be in splendid condition, almost too fat in some cases for dairy animals. To obtain full returns from dairy cows they must be well fed during the whole of the lactation period, *i.e.*, usually for about nine months after calving.

Irrigated Lucerne on the Winning Farm.

If feed is scarce at any time during that period, the milk flow, and consequently the factory cheque, will decrease. In no part of this State is the natural pastures sufficient for nine months on end, so that the growing of crops and the conserving of fodder are necessary if full returns are to be obtained from dairying.

The ideal fodder for dairy cows consists of a mixture of grasses and clovers in bloom, such as is found in the Wagga district in late winter and spring. This provides, naturally, a balanced ration, that is, one in which the different ingredients are in the proportions in which they can be most economically made use of by the cow. The ingredients are protein, the flesh-forming substance, and carbohydrates and fat, which provide heat and energy. Protein is the most expensive ingredient of food to provide, the value of a fodder usually being judged by the quantity of protein it contains. In this respect the Wagga district is fortunate in that the basis of feeding on nearly all farms is lucerne, which contains more protein than any other common fodder. However, lucerne alone does not provide a balanced ration, being deficient in carbohydrates. It therefore requires

mixing with a fodder rich in carbohydrates, and the cheapest and most plentiful fodder of that nature in this district is oaten or wheaten hay or chaff. For example, if a cow were fed a ration of 30 lb. lucerne hay or 30 lb. oaten hay per day, in neither case would a balanced ration be provided, too much of certain ingredients being supplied and not enough of others. The yield therefore would suffer. But if a mixture of 15 lb. lucerne and 15 lb. oaten hay or chaff were fed a fairly well-balanced ration would be provided. This is a matter that is not very well understood, and there is a tendency to feed only one fodder at a time.

It is preferable to feed chaff instead of hay, there being less waste. Oats, either as grain, hay, or silage is a valuable fodder, and one that is easily grown in this district. Any form of silage usually needs the addition of concentrates of some kind or other to provide a balanced ration. Lucerne, again, is the most common form of silage in this district and pits are universally used. It is desirable though not essential to mix the various fodders when feeding concentrates, although mixed fodders are always more palatable. For example, if feeding silage and crushed oats, the oats could be fed in the bails while milking and the silage immediately afterwards.

Pasture Improvement.

The owners of all competing farms were impressed with the necessity for improving pastures, mainly by top-dressing, and to a lesser extent by the sowing of improved pasture plants, such as Subterranean clover and Rye grass. Top-dressing stimulates the growth of the better-class grasses and clovers, while plants like Subterranean clover are effective in choking out noxious weeds, besides providing abundant pasturage. Regarding the green crops, lucerne, of course, always has pride of place, but many areas of Sudan grass were seen to be suffering severely from the dry weather, and in some cases germination was very patchy. This makes one wonder why dairy-farmers do not go to the trouble of fallowing a small area for summer fodder each year. Sudan grass is a valuable fodder, but it cannot be sown until the ground is warm, and when sown on freshly ploughed ground in a dry spring like the present is bound to suffer severely.

Comments.

Little can be said about the herds beyond that farmers generally are keen to develop them along the right lines. The importance of a pure-bred bull is realised, but it is still more important that he have behind him a record for production which he will transmit to his daughters—the herd of the future. Unfortunately there are many pure-bred bulls whose presence in the herd is more likely to have a deteriorating than an improving affect on butter production. Unless the sire of the herd comes from tested stock whose records are known, there is no certainly that his progeny will be better than their parents as dairy animals.

The standard of dairy buildings on the competing farms was very high, and evinces the determination of the dairymen to have nothing but the best and to use labour-saving devices to the full, thus making farm life more

agreeable and the drudgery of dairying negligible. The great value of an overhead water supply is stressed. While three of the competing farmers used steam boilers for hot water supply, the remainder used coppers. It is hoped that herd-testing will be more generally adopted so that all farmers will then compete on an even footing. All farms got full points for cream quality, none of them having supplied second-grade cream to the factories for a period of at least six months.

The piggeries seen were not of a very high order, nor were the pigs. Improvement is needed in the breeding stock and there should be more pure-bred boars and sows. Grazing the pigs is depended on more than artificial feeding.

TRIALS WITH ELECTRICALLY TREATED SEED MAIZE.

TESTS were conducted at Grafton Experiment Farm and at Hawkesbury Agricultural College to determine the effect of treating seed maize with electricity. The tests were made with Fitzroy, Leaming, and Large Red Hogan. In each case the seed was divided into four portions. Portion "A" was electrified by Mr. A. C. Bennett and returned to the Department, "B" was soaked in tap water for twelve hours and then dried slowly, "C" was electrified by the Department in the manner recommended by Mr. Bennett and portion "D" was left untreated.

RESULTS at Grafton Experiment Farm (1927).

Seed treatment.	Fitzroy.	Leaming.
	bus. lb.	bus. lb.
Untreated	67 35	81 8
Electrified by Mr. Bennett	66 24	81 8
Soaked for twelve hours	64 49	82 38
Electrified by the Department	62 28	81 29

RESULTS at Hawkesbury Agricultural College (1927 and 1928).

Seed treatment.	Large Red Hogan. 1927.	1928.
	bus. lb.	bus. lb.
Untreated	72 27	76 34
Electrified by Mr. Bennett	67 36	70 21
Soaked for twelve hours	66 21	72 9
Electrified by the Department	65 6	66 9

These tests were carefully carried out at each centre and all the plots had exactly similar treatment with regard to cultivation, date of sowing, rate of seeding, &c. In every instance the seed that had been electrified failed to give any increase in yield over the untreated seed.

The results of this series of field tests indicate that neither treating the seed maize with electricity, nor soaking it in water for twelve hours can be depended upon to increase the yield.—E. S. CLAYTON, Senior Experimentalist.

Experiments with Cabbages and Cauliflowers.

BATHURST EXPERIMENT FARM, 1928.

R. THOMSON, H.D.A., Experimentalist.

CABBAGES and cauliflowers are among the most important market garden crops in the Bathurst district, large areas of each being planted annually by local growers for the Sydney market. In order to obtain data regarding the most suitable varieties to grow, a trial was carried out at Bathurst Farm during the past season with a number of varieties of each.

The soil was a granite loam previously cropped with onions. All plots were sprayed with a solution of arsenate of lead and a commercial liquid paraffin emulsion on 27th February and 19th March, and the cauliflowers received an additional spraying on 17th April. This spray, although not giving complete control, was very effective in checking the cabbage moth, and adhered to the leaves better than any other spray used. No spray injury was noticed on the cabbages, but the cauliflowers appeared to be scalded and would require a weaker spray.

Cabbages.

The first cabbages were cut on 3rd May, Golden Acre and Enkhuizen Glory being the first to mature. The following table gives the yields from rows of fifty plants each :--

Variety.	Date harvested.	Number marketable.	Total Weight.
			lb.
Enkhuizen Glory	May 3rd	45	155
Succession	„ 12th	44	160
Winningstadt	„ 19th	40	125
Clarendon Ball Head	„ 17th	40	135
Short Stem Drumhead	June 19th	37	112
Golden Acre	May 3rd	35	115
Early Drumhead	„ 19th	33	130

Enkhuizen Glory.—A good early mid-season cabbage of even type. Hearts round and very hard, of medium size, fairly well protected.

Succession.—Another very good variety. Late maturing. Hearts large and firm, slightly flattened, fairly well protected.

Winningstadt.—A mid-season variety. Medium size, conical heart, very firm. Exposed to sun and weather. Type slightly uneven.

Short Stem Drumhead.—A late variety. Drum heart, fairly firm, inclined to open up; plenty of outer leaves. Type even but quality only medium.

Golden Acre.—An early variety. Small, round, firm hearts, well protected. Type fair.

Cauliflowers.

The first cauliflowers were cut on 7th May, Early Phenomenal and Maitland Market being the earliest. The results were as follows:—

Variety.	Date Cut.	Number harvested.
Five Months Special	July 12th ...	45
Six Months Special	,, 28th ...	45
Late Metropole	September 1st ...	44
Maitland Market	May 7th ...	42
Clarendon Early Mammoth	June 28th ...	34
Late Metropole	September 1st ...	33
Early Phenomenal	May 3rd ...	27
Early Phenomenal	,, 21st ...	14
Veitch's Autumn Giant	,, 21st ...	9

Five Months Special.—A mid-season variety of very good quality. Large compact heart; leaves short and curled in; heart fairly well protected. Type very even.

Six Months Special.—A variety very similar to the above, but maturing a month later.

Late Metropole.—A late variety. Large compact heart; leaves large and well curled in; heart well protected. Type very even.

Maitland Market.—An early variety. Medium-large heart of good quality; leaves fairly large but not curled; heart rather exposed. Type even.

Clarendon Early Mammoth.—A fairly early variety. Medium-sized heart; leaves medium large and spreading; heart exposed. Type fairly even.

Early Phenomenal.—An early variety of medium size. Leaves small and upright, rather open. A good cauliflower, but rather uneven.

The Outstanding Varieties.

Of the varieties in the cabbage trial, Succession and Enkhuizen Glory were outstanding for size, quality and evenness of type. The latter variety is particularly notable for the fact that it will hold over in the field a long time without the heart opening up, thus allowing a grower to wait if necessary for a more favourable market.

Of the cauliflowers, Five and Six Months Special were of particular merit, both for quality and evenness of type. Maitland Market and Late Metropole were the best early and late varieties respectively.

The season was a favourable one. Good summer rains were experienced and the frosts held off until late in summer. Irrigation was carried out when necessary.

Blood Poisoning Following Difficulty in Lambing in Merino Ewes.

H. R. SEDDON, D.V.Sc., and H. G. BELSCHNER, B.V.Sc.

DIFFICULTY in lambing (dystokia) is not uncommon in young Merino ewes, but is more common in ewes that have been mated with rams of British breeds, and under certain conditions is liable to be followed by a septic inflammation of the womb and death from blood poisoning.

The opportunity was recently afforded us of making joint investigation of such losses among lambing ewes on a property near Warren. Mortality was reported to be occurring among a mob of 1,000 four-tooth Merino ewes, a day or two after lambing. The only symptoms noticed were loss of power of the hindquarters, external genitals swollen and congested, with a foetid discharge from the vagina. The animals soon went down, were unable to rise, and death followed rapidly. Post-mortem examination revealed the womb to be much enlarged and congested. The country where the sheep were running comprises 1,200 acres, about half of which is flooded country, watered by a cowal from the Macquarie River. The paddock is well timbered near the cowal, which is a favourite place for the sheep. There was a fair quantity of green feed in the paddock, consisting chiefly of green rushes and grasses. The sheep had been on good feed right up to the commencement of the lambing, when they were turned into the 1,200-acre paddock. Sheep blowflies have not been troublesome, but small flies were numerous, especially under the shade of the trees. Only 150 points of rain had fallen during the previous three months. The mortality up to the time of investigation amounted to between fifty and sixty ewes.

Several sheep were observed in the paddock and the following notes regarding these indicate the nature of the symptoms likely to be observed by owners.

Ewe A.—A ewe was observed down on her side endeavouring to lamb. She was watched at a distance for some time, and later approached and examined. The lamb was in normal position with the forelegs just protruding. Assistance was rendered, and a good deal of difficulty experienced in getting the head through. The lamb, which was well developed, was born alive. It was considered that this ewe would not have lambed without assistance in under an hour or more, during which period there would have been every opportunity for infection to occur either through the numerous small flies or from soil contamination.

Ewe B.—A ewe was observed in the paddock on her side and unable to rise. A well-developed lamb had been born, and was dead. The external genitals were much enlarged and congested, and the labia were lacerated. There was every evidence that the ewe had suffered considerably, and had

been some time passing the lamb. The ewe was semi-paralysed in the hindquarters, which was probably due to the protracted labour. The dead lamb was covered with small flies.

Ewe C.—A ewe which had lost her lamb was observed exhibiting a somewhat profuse and foetid discharge from the vagina. The external genitals were enlarged and congested. This ewe was, however, fairly bright, and not exhibiting paralysis of the hindquarters. Numerous flies were hovering about her hind parts.

The overseer reported that he had observed cases of difficulty in lambing from wrong presentation amongst these ewes, chiefly cases where, although the lamb was coming head foremost, the forelegs were turned back. We are of opinion, however, that the difficulty experienced by the ewes has been due not so much to wrong presentation as to the smallness of the ewes and the presence of well-developed lambs.

It will be readily understood that ewes lambing under such circumstances are especially prone to be worried by flies, both the small bush flies as well as blowflies, and that the genitals have undergone such injury that they are liable to become septic. Further, as the flies travel from sheep to sheep, material from those showing a septic discharge is readily carried to ewes that have lambed more recently. Also, as the sheep is lying down the parts become contaminated by dust and dirt. Once the external genitals are infected the septic process extends into the womb, setting up a septic inflammation of the womb (septic metritis). Under such circumstances the milk yield is suppressed and results in the deaths of the lambs that have been fortunate enough to survive the lambing ordeal or neglect by the sick ewes. Many such ewes succumb to the effects of blood poisoning from the septic womb.

It is of interest to note that portions of the above flock had earlier been sold and removed to another district where they were mated with Romney rams. Inquiry was therefore made as to how these ewes had got on during lambing, and we were informed that the owner had lost 5 per cent., all owing to lambing trouble of the same nature as mentioned above. Further losses had been prevented by rendering assistance to ewes which were in difficulty during lambing, for when such assistance had been rendered soon after the ewe started to lamb, both ewe and lamb had been saved. The experience indicates that the trouble had its origin in the sheep and was not due to any local conditions.

Treatment lies in two directions:—

1. Careful shepherding with the rendering of assistance to ewes experiencing difficulty in lambing.
2. Douching of affected ewes. All ewes showing swollen genitals, with a discharge therefrom, should be brought out from the flock (where their continued presence would be harmful), and, after crutching, dressed with suitable lotions. The external genitals and crutch should be swabbed with a weak (5 per cent.) solution of bluestone.

The passage and womb should be douched with a weak solution of condy's crystals (permanganate of potash); this may be done either by means of a syringe or by irrigation, using a piece of rubber tubing and a funnel. Such sheep should not be returned to the flock until all discharge has ceased, otherwise they will simply be an attraction to flies and these may carry the infection to other ewes.

New Objectives in Wheat Breeding.

Farrer achieved such wonderful success in wheat breeding in Australia, particularly with his variety Federation, which is still grown largely in Victoria and New South Wales, that it was considered by many that the pinnacle had been reached and that very little further progress could be made.

The work which has been continued by plant breeders in New South Wales has been rather in the direction of producing earlier varieties of high productivity, and both Canberra and Waratah are outstanding examples of the success of this objective. A change in the objectives in wheat breeding, however, has necessarily been brought about in recent years through the increasing ravages of diseases, which take a heavy toll of the crop in some years. The present leading varieties—Federation, Waratah, and Canberra—all suffer from the effects of diseases in certain seasons and under certain conditions, while it is known that other varieties are not so badly affected. This indicates a varietal resistance or susceptibility which the plant breeder must consider in the production of new wheats, if they are to be superior to the present varieties.

In his day, Farrer did not have to concern himself with breeding for resistance to flag smut, but this phase is now regarded as one of the most important objectives of the wheat breeder. By keen observation, Farrer achieved a certain measure of success in breeding rust-resistant wheats; but in his time nothing was known of the specialisation of physiologic forms of rust, some varieties being resistant to some forms and susceptible to others, and Farrer could, therefore, not make the headway in this work which is now being undertaken with a wider knowledge of the incidence and a better understanding of the inheritance of rust, and which, therefore, promises much greater success than Farrer achieved in this direction.

Other diseases are also being investigated from the varietal aspect to discover, if possible, whether any varieties have an inherent resistance which can be turned to account by the plant breeder. Moreover, the wheat belt is extending each year into districts of more limited rainfall, and wheats of greater inherent drought resistance are needed than when Farrer was engaged in this task.

Though the task of the wheat breeder has been rendered sterner and his problems more difficult since the time of Farrer, we can never detract from his wonderful work; firstly, because his Federation wheat has held pride of place for so many years, and, secondly, because many of the most promising varieties to-day in Australia still have a large mingling of Federation "blood."—H. Wenholz, Director of Plant Breeding.

New South Wales Butter Flavour.

Lasting, Natural and Low Acid Characteristics in Popular Demand.

A. M. BROWN, Special Dairy Instructor.

At the Annual Conference of Butter Factory Managers and Secretaries held in Sydney in June last, a number of speakers—fortunately they were very much in the minority—made certain remarks concerning the flavour of New South Wales butter, which were of a distinctly disparaging nature. The gist of these remarks were:—

1. That flavour had been sacrificed for keeping quality by the fact that our butter lacked natural flavour.
2. That the flavour had slipped back.
3. That as a means of retrieving the position thus created the use of lactic starters is necessary.

The first two assertions constitute criticisms of the general quality of our butter and also of the manufacturing methods employed in butter factories throughout this State. Either, the gentlemen who made these statements are not conversant with the overwhelming weight of evidence to hand which indicates that these criticisms are totally undeserved, or else for some reason they do not wish to accept definite evidence as proof, However, their statements cannot be allowed to remain unchallenged.

Keeping Quality of First Importance.

Butter being a perishable commodity, its keeping quality becomes of paramount importance. Therefore, the primary efforts of manufacture should be directed towards obtaining satisfactory results in this direction. The following facts supply conclusive evidence that New South Wales manufacturers have applied themselves to attain such results with definite success:—

1. Official reports by the Commonwealth Grading Officer in London indicate that the quality of New South Wales butter during the 1927-28 season was better than that from any of the other Australian States arriving on the market. Numerous private reports from other sources also support this statement.
2. Recent competitions for export Australian butter, comprising tests as to keeping quality, and instituted by the Royal Agricultural Society of New South Wales for the Orient Shipping Company's prize, as well as various other similar competitions of an interstate character have all been won by exhibits from New South Wales.

3. Our butter has also regularly secured pride of place at Islington Show, England, in competition with the product of other Australian States and Dominions.

Flavour not Sacrificed for Keeping Quality.

If so-called pronounced acid flavour can be considered as natural to butter, then our product is lacking in this respect. However, it is definitely contended that this type of flavour is not characteristic of butter, but that the mild, low acid nutty flavoured "choicest" quality article produced by the factories of New South Wales conforms most admirably to a generally accepted standard in this regard. This latter is a type of butter which (1) bears the Australian national brand, "Kangaroo," denoting "choicest" quality when exported to oversea markets where it has achieved such a high reputation for its keeping quality in competition with the butter from other Australian States and from other countries; (2) has been responsible for building up our local trade to such an extent that the latter has become of first importance to the dairying industry of this State, the increase in the last ten years being nearly 100 per cent., namely, from 21,000 tons per annum to 40,000 tons; (3) has been the means of increasing the per capita consumption from 25 lb. in 1916, to 35 lb. in 1928; (4) has been accountable for the consuming public of New South Wales to-day demanding only a "choicest" butter, possessing a type of flavour dissimilar to that advocated by these critics; and (5) has become popular in other Australian States, thereby definitely increasing our interstate trade in this commodity.

Amongst other important items associated with manufacture, one of the factors responsible for the achievement of such satisfactory results as those abovementioned has been the adoption of comparatively low acidity in connection with the neutralising process, for throughout this State it has become the practice of manufacturers to neutralise cream before pasteurisation to from .15 per cent. to .2 per cent., and even as low as .1 per cent. acid. Abundant proof has been forthcoming that, beyond doubt, many "off" flavours become almost invariably associated with high acidity in butter, especially after storage, and it was this fact which led to considerable experimental work being carried on from time to time by the field staff of the State Dairy Branch and by factory managers, which work has resulted in the successful adoption of this margin of acidity.

Flavour Continues to Improve.

Quality and flavour in connection with butter are synonymous or identical factors; therefore, if the former has shown improvement, then it must be granted that the latter also has done likewise.

With such undeniable evidence to hand as that already quoted, which indicates most forcibly that the general quality of the butter produced throughout this State has reached a particularly high standard, coupled with the following items which constitute additional proof of this fact,

it is apparent that no reasonable grounds exist for the extravagant statement that the flavour of New South Wales butter has slipped back:—

1. In their reviews concerning the general quality of New South Wales butter during the 1927-28 season, and which reports were presented at the last Butter Factory Managers and Secretaries' Conference, both the Senior State Grader and the Senior Commonwealth Grader remarked on the improvement noted during that period. These officers are in the unique position of being able to make accurate, unbiassed comparisons by virtue of the fact that they are intimately associated, in their different spheres, with the grading of the whole of the butter produced by the factories in New South Wales. Similar opportunity in this respect is not available to any other persons connected with the dairying industry in this State.

2. During the past season a great number of instances were noted where butter previously of inferior quality showed marked improvement and was continually graded "choicest." These instances were in greater proportion than those where butter previously of satisfactory quality showed deterioration in this regard.

3. During the 1927-28 season the actual grading points allotted to many brands of butter were just as high as were secured by these same brands during the 1926-27 season. In some cases higher points were recorded during the later period. These remarks also apply to the majority of the butters competing in the Continuous Grading Classes at the Royal Agricultural Society's Show.

4. A statement has been made by the Commonwealth Grading Officer in London that the quality of butter from one particular factory in New South Wales had turned out to be better on that market than that of the product of any other country in the world.

Suggested Use of Lactic Starters to Improve Flavour.

There are certain features connected with the use of lactic starters which merit the serious consideration of those who may be inclined to advocate or adopt these pure cultural methods in the manufacture of butter in New South Wales before any definite step in this direction is contemplated. They are:—

1. Very few managers have so far had experience in the preparation, care, and use of starters.

2. Experiments with lactic starters in connection with every-day manufacture under existing conditions may have an opposite effect to that desired, and may inadvertently be the means of damaging the reputation of the butter from any of the factories concerned, both on the local market and in London, and reduce the local per capita consumption rate. Instances have been recorded where

the use of contaminated starters has caused fishiness in competing exhibits in show competitions for stored butter. One of these instances is of very recent date, but it is also a fact that starters have, on occasion, been used with success in similar competitions. However, even if the results of experiments with the use of pure cultural methods in the every-day manufacture of our butter were satisfactory in the majority of cases, it is safe to say that many failures would occur under the existing conditions, and these failures would constitute a serious menace to the high reputation at present enjoyed by our butter both locally and abroad. Fishy flavour in butter is a fault most easily recognised and generally disliked. It is now very rarely associated with the New South Wales product.

3. Starters are used in the manufacture of Danish butter, but those who are conversant with the type of butter required for our local trade, and who have examined the samples of the product from that country, which were exhibited at the last two Factory Managers' Conferences, must have realised its unsuitability for distribution to New South Wales consumers, not only on account of its inferior quality but mainly because of its very pronounced acid flavour.

4. It has been remarked in some quarters that the use of cultural methods may possibly be the means of bridging the gap in prices which exists in London between Danish and New South Wales butter, but even if this were so, it would not pay for the present at least to materially alter the type of butter demanded by our extensive and more remunerative local market in order to specially cater for the requirements of a trade of very much smaller dimensions afforded by English consumers.

5. New Zealand butter, with its much less acid flavour than that of the New South Wales product, and of a correspondingly milder character, sells in London at approximately 10s. per cwt. above the quoted realisations for butter from this State, which fact indicates that the English market is not biassed in favour of a pronounced acid butter, and does not specially demand an article made from cream appreciably inoculated with a pure lactic starter.

In dealing, in detail, with the matters under discussion, it is not desired to create the impression that perfection has been attained by the manufacturers of butter in this State, nor is it intended to create a complacent attitude amongst those interested in butter manufacture. Anyone conversant with the details of factory procedure must realise how the attainment of this standard is rendered almost impossible by certain existing factors. The human element, breakdowns and other practically uncontrollable happenings, all present difficulties to be surmounted before the highest degree of excellence is attained, but after considering what has already

been accomplished in regard to quality, it is maintained that the methods employed in the production of butter in this State have met with such success that it is at least very doubtful whether the necessity actually exists at the present time for any drastic alterations in the manufacturing process. However, when the application of science, or when existing conditions (including public opinion and taste) make it apparent that such alterations or innovations are essential to the advancement of the dairying industry, then similar co-ordinated effort will be applied as in the solving of problems that have previously arisen in connection with butter manufacture, and which have been solved either by the Dairy Branch of the Department of Agriculture, or by that branch co-operating with the Biological Branch, or by factory managers.

The Chief Functions of Mineral Constituents of Feeding-stuffs.

The requirements of mineral matter or salts received but very scanty attention until recent time. . . The chief functions of the mineral constituents performed in the animal body are the following:—(1) They are necessary for the maintenance of a proper physiological balance between the mineral elements in the body fluids. Any excess or deficiency of any one of the mineral constituents will affect the vital processes. A deficiency of potassium in the blood will act on the heart muscle and prevent it from relaxing properly, while an excess makes it relax so much that it stops beating. Common salt is an absolute necessity for nutrition, but given in excess will act as a poison and cause serious troubles. The mineral constituents maintain the practically neutral reaction of the blood. (2) They are necessary for the process of digestion. The digestive processes are affected by acidity and alkalinity of the digesting fluids. In the stomach an acid reaction must exist to aid in the pepsin digestion, whereas in the small intestine an alkaline reaction is necessary to allow the trypsin to act. The absorption of the digested products again is controlled by the concentration of the salts, and this concentration will also affect the passage of digested and undigested material along the intestines. (3) Mineral constituents are required as constructive material for the formation of new tissue and building up of the bone skeleton. (4) Milking animals require larger supplies of mineral matter to keep up the yield and average composition of the milk secreted.—J. C. Brünnich, Agricultural Chemist, Queensland Department of Agriculture.

The Influence of the Scion Upon the Root-Stock.

With regard to the comparative influence of particular varieties of scion upon any variety of root-stock, it has been found that although such an influence does exist, it appears to be quantitative rather than qualitative, and at any rate quite subsidiary to the much more potent reciprocal influence of the root-stock upon the scion.—From a paper prepared, at the request of the Empire Marketing Board, by the Director of the East Malling Fruit Research Station, England.

Poultry Notes.

March.

E. HADLINGTON, Poultry Expert.

The Green Feed Supply.

An adequate green feed supply should be the aim of every poultry-farmer: the labour and capital expended on its establishment will be amply repaid. Apart from the saving which can be effected where a good crop exists by substituting portion of the bran with chaffed green lucerne, barley, oats, &c., green feed supplies quantities of vitamines and also acts as a tonic and assists in keeping the digestive tract in a healthy state.

There are numerous crops which can be used for green feed, and while the main considerations in the choice of a crop are the food values and suitability for supplying to the birds, it is also necessary, under our climatic conditions, to select a crop which can be grown readily and one which will withstand dry spells. Taking all factors into consideration, lucerne stands out as the most satisfactory permanent crop. Where it can be watered when necessary, it provides a continuous supply of greenstuff practically all through the year, and lasts, with proper attention, from seven to ten years. During the coldest winter months, when lucerne does not make such quick growth, other crops could be grown to make up the deficiency. Such crops as barley, rape, kale, or Berseem clover, if sown during March and April, are among the best for winter use.

Where there is a shortage of greenstuff due to the previous drought conditions, a small area of maize planted now that the soil is moist after the rains would help to provide a quick supply, but it should not be allowed to grow too coarse before cutting, as it is essential that it be used in a succulent state, otherwise it may cause digestive troubles. In using maize it is, of course, necessary to chaff it up finely.

Lucerne Growing.

Where the city water is laid on, or a permanent water supply is available, lucerne can be grown on almost any land in the County of Cumberland, provided that poultry manure is applied liberally and in a proper manner. Even on poor, sandy soil, good crops can be grown under the conditions stated above.

Lucerne can be sown during this month and up to as late as May, or again in the spring, but April is about the most satisfactory month for districts near the coast. To give lucerne a proper chance of becoming established it is essential that the ground be as free as possible from weeds, and a very fine surface is absolutely necessary. Where the land has been previously fallowed, it is not advisable to plough deeper than about 4 inches prior to sowing. A thorough harrowing should follow upon ploughing, and then the ground should be rolled to break up the soil to a fine tilth. On

heavy soils a further harrowing is advisable after the rolling to prevent caking after rain.

In most areas in the counties of Cumberland and Northumberland, lucerne is best sown in drills 18 to 24 inches apart. This permits of cultivation between the rows, and enables the crop to be top-dressed by applying poultry manure liberally between the rows and allowing it to rot before digging in. Care should be taken not to apply fresh manure close to the roots, otherwise injury may result.

The two best varieties of lucerne for the coastal districts are Tamworth and Hunter River, but there is a great variation in the quality of the seed. It is false economy not to secure the best obtainable—free from weed seeds, dodder, &c. The quantity of seed required for sowing on the class of land usually occupied by poultry-farmers would be somewhat less per acre than for lucerne-growing areas, and about 10 to 12 lb. per acre would be sufficient in most cases.

Poultry-farmers would be well advised not to undertake planting a larger area than they can properly attend to; it is far better to have a small patch of lucerne which can be watered and given the necessary cultivation, than to attempt to plant more than can be managed, and have it smothered by weeds or dried up because it cannot be watered and mulched with manure.

Beware of Fowl Tick.

During the past year or so quite a number of fowl tick infestations around Sydney have been investigated. In most of these cases the source of infestation has been traced to birds having been brought in from country districts, but in some instances it is probable that the ticks were carried in crates, &c. The fact that ticks are being found in close proximity to commercial poultry farms should be a warning to anyone handling birds coming from the country districts, or having coops returned from such areas.

While this pest thrives best in the hot, dry districts (and it is found in most countries with such climatic conditions), the fact that ticks have lived on the coast here for a number of years indicates the necessity for care in sending birds down from the tick-infested areas. In fact, if the tick continues to spread it may become necessary to prohibit birds coming from such areas into the coastal districts.

Although, as will be shown later, the tick can be controlled, the infestation of a large number of commercial farms would cause a great deal of trouble and expense to keep the parasite in check. In view of the introductions of tick into the metropolitan area during the last few years, it is thought desirable to indicate to poultry-farmers who may not be familiar with the tick the habits of the pest and the methods adopted to control it.

One of the main reasons why this pest is so prevalent in country districts is that the unsystematic methods of keeping poultry favour its spread. There is also a general lack of knowledge with regard to its habits, and consequently no serious and persistent effort is made toward its eradication. The prevailing idea is that the only way to get rid of the tick is to burn down the fowl houses. Where the houses are of such a ramshackle nature as to be of no value and to render treatment too difficult, this may be

necessary, but the great trouble is that on the average farm in the country the fowls are allowed to roost in any place they choose, such as in trees, on fences, and in barns, as well as in the so-called fowl house, which often consists of a few sheets of bark supported by bush poles, with the same class of timber for perches. The cracks in the bush timber and the bark form an ideal place for the ticks to secrete themselves in and breed. The trees and fences also harbour the vermin. The result is that even though the houses are destroyed the ticks are not all exterminated.

How to Control the Tick.

The first step towards eradicating the tick is to ensure that the fowls roost only in the houses. This may appear difficult, but if a house and run are built so that the birds can be shut in at night they can be fed in the run and shut up at feeding time. Those which attempt to fly out should have one wing cut to keep them out of trees, &c.

Spraying with kerosene emulsion is about the cheapest and most effective method of destroying ticks, but no matter what spray is used it is advisable to repeat the sprayings several times at intervals of two or three days, as some ticks are almost certain to escape the first time, and even if none are missed some seed ticks may drop off the birds. The houses should be thoroughly sprayed inside and outside, including the roof, floor, nests, perches, and any timber in close proximity. The correct procedure in spraying is to direct a strong fine spray into all crevices first. This will bring out the concealed ticks, which can be further sprayed in going over the surface again with a somewhat coarser spray. The amount of time required to do the work is not as great as may appear, and when the ticks have been cleared out it is only necessary to spray again occasionally when there is any sign of a fresh infestation.

There is absolutely no doubt about the efficacy of kerosene emulsion for the killing of the ticks; numerous tests have been carried out and badly infested houses have been completely cleared of the pest. Painting the perches and walls, &c., with wood-preserving oil, or creosote, is also useful in combating the tick, but it is impossible to reach all crevices by painting with a brush, and in any case the expense would be much greater.

How to Make the Emulsion.

All that is required to make the emulsion is soft soap, kerosene, and boiling water. Take ½ lb. of soft soap, dissolve it in a gallon of boiling water, and add slowly to this, stirring briskly all the time, 1 gallon of kerosene. Continue stirring the mixture for a few minutes until it is of a creamy consistency. This is the "stock," and it should be added to 9 gallons of soft water, making 11 gallons of spray. The mixture should be stirred well with the water whilst it is being added, and it is as well to keep the solution stirred occasionally when spraying.

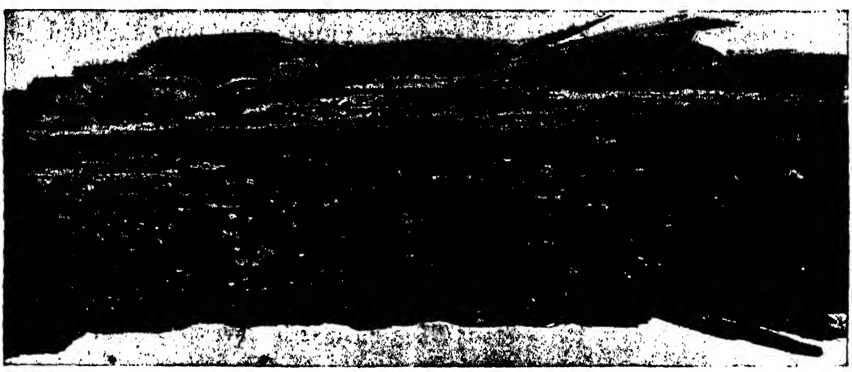
On no account should water containing lime, salt, or any caustic substance be used, as "hard" water will cause the oil to separate and thus render the spray useless. Do not attempt to mix all the constituents together at once—the solution will not emulsify except when made as directed.

No Need to Dip Birds.

An idea exists among poultry-keepers in tick-infested areas that the only way to rid birds of the larval ticks is to dip them in some disinfectant solution. This practice is not necessary, and may be very harmful in unfavourable weather.

A simple and effective treatment is lightly to smear the bare parts of the body of the birds where the larval ticks are found with a little grease or salad oil. On no account should kerosene be used, as it will blister the skin and cause losses.

In removing birds from infested quarters to a clean house there is little risk of the adult ticks being carried on them if the birds are caught in the day time while away from the infested quarters, as the adult ticks live in the woodwork of the houses, fences, or in the bark of trees during the day. Should, however, the birds be closed in the infested quarters to catch them, the ticks may accidentally get on them. If larval ticks are found on the birds, the treatment previously suggested should be adopted.



Piece of old splintered wood infested with Fowl Tick.

Habits of the Fowl Tick.

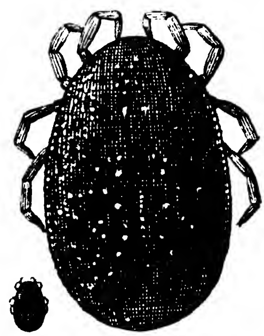
Being a nocturnal parasite, the fowl tick is seldom found upon the birds in the daytime, except in the larval stage. For this reason many people in tick-infested areas, who look only on the birds, fail to find evidence of the ticks and conclude that they are not responsible for the mortality among their fowls. During the daytime the ticks secrete themselves in any cracks or cover available near where the birds roost. It is therefore in such places that they should be looked for. The blade of a penknife inserted into crevices of the walls, &c., near the perches will usually show whether the ticks are present or not.

The adult ticks come out at night and suck the blood of the birds; they can engorge themselves in about half an hour. They retreat during the day to their place of hiding. It is here that they lay their eggs, which hatch out in about three weeks.

Poultry-keepers should not delude themselves that they can get rid of ticks by leaving the houses unoccupied for a season, because ticks may live in the houses for a couple of years or more.

Cause of Mortality.

Birds attacked by ticks do not usually die through loss of blood, although where ticks are very numerous some losses may occur as a result of the birds becoming emaciated through loss of blood and irritation. The chief cause of death is that in biting the birds the ticks inoculate them with a disease called spirochætosis, causing a high fever which runs its course in a few days, resulting in considerable mortality. Some birds recover, and these are more or less immune from further inoculation with the disease. This is why in some cases ticks can be numerous without causing many losses, whilst among other flocks where new birds have been introduced the death rate is very high. The progeny from stock that have recovered from spirochætosis appear to be less susceptible to the effects of inoculation by that disease than chickens bred from the parents which have not been in contact with ticks. Hence the necessity for care in housing birds brought in from tick-free districts to see that they do not become infested. This should not deter poultry-keepers in the country from purchasing birds from other sources, because without the introduction of new blood the flocks would soon degenerate, and the results would be worse than the effects of the ticks.



Fowl Tick.
(*Argas persicus.*)
The smaller figure shows a specimen life size.

Symptoms of Spirochætosis.

It is surprising that many people in the tick-infested districts are not aware of the symptoms shown by fowls infected by the tick disease spirochætosis; very often the birds so affected are thought to be suffering from poisoning or some strange unknown disease. Some of the symptoms are the same as would be present in almost any serious ailments; but one feature which distinguishes tick fever from most other affections is that the birds usually run a high temperature, which is apparent by feeling the legs or under the wings.

The first indications of the disease are that the affected birds become dull and stand about the pens, the feathers may be somewhat ruffled, there is loss of appetite, the comb turns dark, and the face pales, and as the disease progresses a haggard expression is evident, and there may be signs of paralysis. Diarrhoea is nearly always present.

The disease may run its course in a few days, or mortality may occur in a much shorter time; in other instances the birds may linger for a week or more and finally die, or may gradually recover.

Orchard Notes.

March.

C. G. SAVAGE AND W. LE GAY BRERETON.

Green Manure Crops and Cultivation.

WHERE crops for green manure were sown in districts that shared in the February rains, a good start should be assured. However, it should be remembered that even in districts which normally have a copious rainfall, there has been a prolonged dry period which practically exhausted the moisture from deep down in the subsoil, and it will require repeated soaking rains during the fall or winter to make up these reserves. If these should not occur, it would be wise to plough under any green crops, even should they be only partly grown by mid-winter, for if a dry winter is followed by a dry spring, the trees will be taxed sufficiently without any competition for moisture from a cover crop, either sown or volunteer. Of course, where water for irrigation is available, soil moisture is under the grower's control, and green crops can be allowed to remain until July.

It is not too late to sow green manure crops during March in some districts, but considering the exhaustion of subsoil moisture that has occurred during this summer, and the uncertainty of having sufficient winter rains to make up this deficiency, it seems wiser not to sow such a crop this season.

Where no green manure crop is growing, an effort should be made to carry out an early fall ploughing—in fact, if possible a start could be made at once on all beds of trees that have been picked, and each bed similarly treated as picking is completed. Ploughing puts the soil in a suitable condition to absorb any rain that falls, and will thus assist in regaining moisture reserves in the subsoil.

Preparation for Planting.

Where it is intended to plant a new area, it is an advantage to plough and subsoil, leaving the surface in a rough state some months before planting, as then it can be depended on to be in moist enough condition to receive the trees at any time desired during the deciduous planting season.

It is not too late in the warmer coastal districts where severe frosts are not experienced to plant citrus trees during the early part of this month.

Harvesting.

Apple and pear growers will be busy this month getting their fruit away. The later peaches, mainly cling-stones, will be coming in. As the canneries are only taking comparatively limited quantities, much of this fruit will be marketed fresh. A leaflet on picking and marketing is obtainable free on application to the Under-Secretary, Department of Agriculture, Box 36A, Sydney.

Drying of Prunes, Sultanas, and Lexias.

Prunes, sultanas, and lexias will be ready for drying. During the past few years, the cold dip for sultanas has been extensively tried in this and other States. The claim made for the cold dip was that a better and more even-coloured sample could be obtained by its use, provided no damaged fruit was treated. Though this may be the case, the cold dip involves more handling, which puts up the cost of production considerably. The fruit also takes longer to dry than when treated by the old hot caustic soda dip method. The disadvantages of this prolonged drying are particularly felt in wet seasons, and though the cold dip may be suitable in countries where the grape harvesting season can be depended on to remain dry, it is a risky process to adopt in some of the raisin districts of this State.

Of recent years, certain modifications have been made to the old hot caustic soda dip. The temperature has been reduced from boiling point to 192 to 196 deg. Fah. A very short immersion is given, the fruit being passed through the dip as quickly as possible. The strength of the dip should be sufficient to remove the waxy covering of the grape during the short immersion in the dip at this reduced temperature; slight cracking of the skin of the berry is not necessary. The desired strength is generally obtained by using the caustic soda at the rate of about 1 lb. to 25 gallons of water, but the exact strength can only be arrived at by trial. The dipping tins should be liberally perforated to allow the dip to get away instantaneously from the fruit as it is withdrawn from the dip. The fruit should not be allowed to remain in the tins after dipping for any length of time, but should be spread as soon as practicable.

Large bunches should be divided into sections before dipping, both to allow the dip to penetrate quickly and afterwards to hasten drying. Likewise the fruit should not be spread too thickly on the rack. The dip should be kept skimmed of any scum, and should be renewed after a fair quantity of fruit has been through, otherwise it will become dirty and dry in globules on the fruit.

To obtain a weighty, good quality, meaty, dried product, the grapes should be fully ripe. Their maximum sugar content is reached some days after they have reached a palatable state to eat fresh. In order not to lose good drying weather, picking is generally started before the maximum sugar content is reached, but should not be started before the must registers 13 degrees Baumé. During the early stage of drying, if hot weather prevails (say, 90 degrees or over in the shade), the sun should not be allowed to shine on the fruit, and the hessian curtains should be used on the side of the rack necessary to prevent this.

As in the case of the cold dip, the modified hot caustic soda dip should not be employed for damaged fruit. The modified dip prolongs the period of drying, hence if bad weather prevails during the grape drying season, the old hot dip should be resorted to.

Great care should be taken that the fruit is properly dried before it is removed from the rack, as if disturbed before, much fruit will be broken and the colour of the whole spoilt.

A leaflet on drying prunes, currants, sultanas, and lexias is obtainable free from the Department of Agriculture.

Pests.

Citrus Scale.—The February rains will have revived the citrus trees in the coastal districts, which will allow treatment for scale insects to proceed. Leaflets on fumigation of citrus trees are obtainable free from the Department.

Codling Moth.—During the rush of picking and packing, apple and pear growers are tempted to neglect the codling moth. This is a short-sighted policy, for although neglect at this period may not apparently affect this year's crop, it will certainly increase infestation next season. A leaflet on the control of this pest is also obtainable free from the Department.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1929.

Cessnock (Bill Brown)	Mar.	6, 7, 8, 9
Bowral Horse Show	,,	8, 9
Campbelltown (W. N. Rudd)	,,	8, 9
Rydal (H. Murray)	,,	8, 9
Luddenham (J. McKnight)	,,	8, 9
Penrose (C. E. Brice)	,,	9
Gundagai (P. J. Sullivan)	,,	12, 13
Molong (W. P. Stanger)	,,	12, 13
Nimbin (S. H. Kilmister)	,,	13, 14
Bombala (P. J. Jonas)	,,	14, 15
Camden	,,	14, 15, 16
Mudgee (O. Wilkins)	,,	14, 15, 16
Goulburn (T. Higgins)	,,	14, 15, 16
Granville (B. Hyslop)	,,	15, 16
Moruya (H. P. Jeffery)	,,	15, 16
Blayney (W. Ware)	,,	19, 20
Tumbarumba (M. Kinstler)	,,	19, 20
Kempsey (E. Mitchell)	,,	19, 20, 21
Muswellbrook (R. C Sawkins)	,,	19, 20, 21
Wallamba (E. A. Carey)	,,	21, 22
Liverpool (B. C. Fitzpatrick)	,,	22, 23
Warringah and Manly (W. T. Bate)	,,	22, 23
Wingello (J. E. Creelman)	,,	23
Batlow (C. S. Gregory)	,,	26, 27
R.A.S., Sydney (G.C. Somerville)	,,	27 to Ap. 6
Orange (G. Williams)	April	16, 17, 18
Wingham (D. Stewart)	,,	17, 18
Grafton (L. C. Lawson)	,,	17 to 20
Hawkesbury (R. B. Tate)	,,	18, 19, 20
Buladelah Bureau (F. Coleman)	,,	19, 20
Wellington (N. Cook)	,,	23, 24
Maclean (T. B. Notley)	,,	23, 24
Stroud (C. E. Price)	,,	26, 27
Casino (P W. Swanson)	,,	30, May 1, 2
Dungog (W. H. Green)	May	1, 2, 3
Kyogle (D. Campbell)	May	8, 9
East Gresford (A. R. Brown)	,,	10, 11
Trangie (A. K Butter)	,,	15, 16
Forbes Sheep Show (K. O. Anderson)	July	10, 11
Cootamundra Sheep Show	,,	24, 25
Peak Hill (T. Jackson)	,,	30, 31
Young Sheep Show (T. A. Tester)	,,	31, Aug. 1
Tullamore (A. N. Cornett)	Aug.	7, 8
Trundle (W. P. Forrest)	,,	13, 14
Illabo	,,	14
Lake Cargelligo	,,	20, 21
Condobolin (J. M. Cooney)	,,	20, 21
Wagga (F. H. Croaker)	,,	20, 21, 22
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Grenfell	,,	27, 28
West Wyalong	Sept.	3, 4
Parkes (L. S. Seaborn)	,,	3, 4
Young (T. A. Tester)	,,	4, 5
Ganmain (C. C. Henderson)	,,	10, 11
Forbes (K. O. Anderson)	,,	10, 11
Cowra	,,	10, 11
Barmedman	,,	11
Canowindra	,,	17, 18
Temora	,,	17, 18, 19
Murrumburrah	,,	24, 25
Barellan	,,	25
Boorowa	,,	26, 27
Ardlethan	Oct.	2
Quandialla	,,	2
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Ariah Park	,,	9
Bribbaree	,,	9
Griffith	,,	15, 16
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CONTENTS.

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G. D. ROSS,
Under Secretary,
Department of Agriculture

Vol. XL. Part 4. April 1, 1929.

Agricultural Gazette of New South Wales.

Farm Forestry.

V. The Native and Introduced Trees of New South Wales.

[Continued from page 54.]

R. H. ANDERSON, B.Sc. (Agr.), Assistant Botanist, Botanic Gardens, Sydney, and Lecturer in Forestry, University of Sydney.

Introduced Trees of the Western Slopes Division—*continued.*

The Carob Bean (*Ceratonia siliqua*).

This tree has long been cultivated as an important farm crop in Mediterranean regions, being grown everywhere in the fields and regarded as an "upper storey of productiveness." The pods are rich in protein and sugar and are a valuable forage crop, thousands of tons being exported annually to England and other places. Male and female flowers are usually on distinct trees.

It is a handsome evergreen tree, useful for shade and shelter purposes, and can be cut to form a strong growing hedge. It is essentially a warm, dry climate species, and although it will grow on a variety of soils, prefers a moderately rich deep soil with a fair proportion of lime. It is rather slow growing at first, but is very long lived.

Plants can be raised from seed, the seed being best soaked before sowing. The best results are obtained by growing seedlings and budding from the best varieties, the plants being fairly large when planted out. Stock should be put out in containers, as they do not stand root disturbance too well.

In the Western Slopes Division it does well in the better watered parts, particularly in the south. Where the rainfall is low it requires some watering for the first few years. It responds well to summer irrigation.

Plane Tree (*Platanus orientalis*).

An ornamental deciduous tree with handsome dense foliage and a characteristic smooth, light-coloured bark, mottled in the winter months by darker blotches of the older bark. It is a shapely, hardy, quick-growing species, little troubled by disease, and a general favourite for shade and street planting. It stands pruning well and young stock is easily transplanted. It does best on deep, fairly free, and moderately fertile soil. The hairs of the young leaves when detached by wind sometimes cause irritation to the mucous membranes of the eyes, nose, and mouth, but this should not be regarded as a serious drawback, as the potentially troublesome period is very limited. It is a good species for planting for ornament and shade where a deciduous tree is required.

Another Plane Tree is *Platanus occidentalis,* which possesses much the same features as the above.

False Acacia or Black Locust (*Robinia Pseud-acacia*).

A rather ornamental deciduous tree with prickly branches, bright green, graceful, pinnate foliage, and white fragrant flowers. It is not particular as to soil requirements and stands transplanting well. It is a favourite street tree in Europe, and is adaptable to pruning. The timber is hard, close-grained and durable, a point which is not so important in a country so rich in durable hardwood species as Australia. This tree, has, however, a bad habit of suckering from the roots, especially when planted on shallow soils, and frequently becomes a nuisance on this account.

It is grown in a number of localities in the Slopes Division.

Camphor Laurel (*Cinnamomum Camphora*).

A handsome, dense-topped tree, especially when young, which makes good growth in many parts of the State, including the better watered portions of the Slopes Division. Generally speaking, it requires a fairly good supply of summer moisture, being a native of heavy summer rainfall forests. Although not thriving on wet soils, it does well with a moderately damp subsoil.

An excellent tree for breakwinds, making good, dense, although slow growth, and is commonly planted as an avenue tree, for shelter around houses, or kept cut back as a tall hedge.

Osage Orange (*Maclura aurantiaca*).

A deciduous tree with spreading branches which is usually grown as a hedge plant or as an ornamental tree for the foliage and conspicuous orange-like fruit. The branches are armed with stout thorns and have a milky sap. The fruit is not edible. It is not particular as regards soil conditions, but the roots are long and greedy feeders. It can be propagated easily from seeds or suckers, but its usefulness lies mainly in its ability to form a fairly dense impenetrable hedge of the taller type. It is grown to some little extent as an orchard break in such districts as Forbes, Parkes and Albury.

Broad-leaved Wattle (*Acacia pycnantha*).

A small tree of ornamental appearance with comparatively large, deep yellow flowers, the rather stout stalks of which distinguish it from many other Acacias.

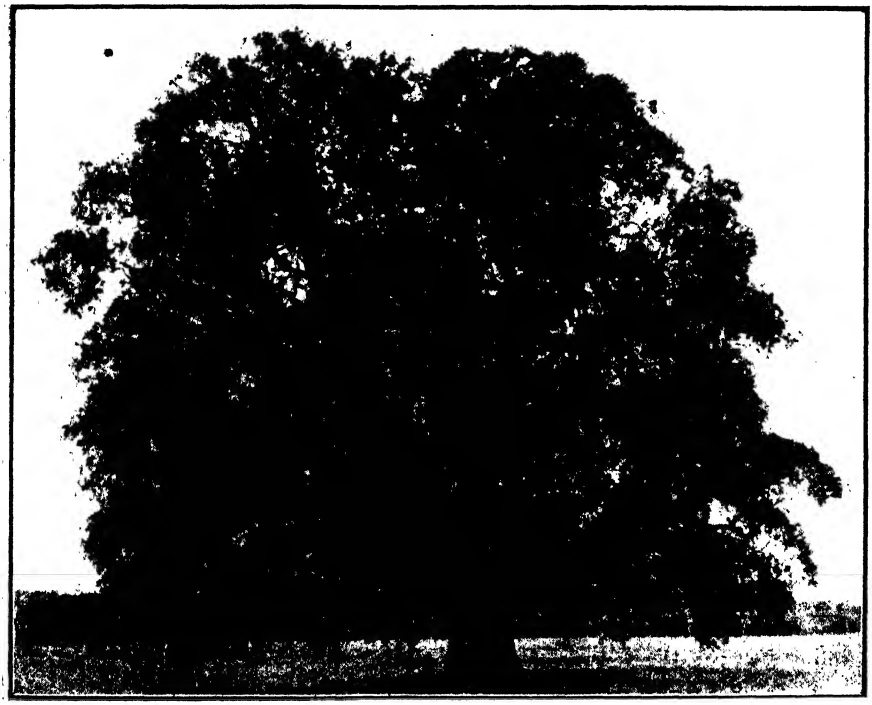
It occurs naturally in South Australia, Victoria and one or two isolated localities in the extreme south-west of New South Wales, but has become practically naturalised in many parts of the south-western slopes and lower tablelands. It frequently makes thin-stemmed growth and is found in thicket-like formations. It is not particular as to soil requirements, but appears to prefer a fairly hot, dry climate with a moderate rainfall.

The bark of this species is one of the richest tanning materials in the world, making it a tree with possibilities for commercial exploitation. It is also an ornamental species worthy of cultivation in western gardens.

QUEENSLAND SILVER WATTLE (*Acacia podalyriaefolia*).

This is one of the most popular of the cultivated Wattles. It flowers profusely and for a longer period than most other species, the silvery leaves being also very attractive. It has been recorded from the north-western portion of New South Wales near the Queensland border, but is typically a Queensland species.

In the Slopes Division of New South Wales it has proved to be fairly hardy, making good growth and being useful for ornamental purposes, as well as for providing temporary shelter belts and shade trees. Like most other Wattles, it is short-lived, but can be used as a nurse for other long-lived species.



Agonis flexuosa.

Agonis flexuosa.

This tree is a native of Western Australia, and although not cultivated in the Western Slopes Division, is one which deserves some experimental planting, as it would appear to be assured of success. In Western Australia it is widely distributed along the western coast, frequently in the zone with a 20 to 30 inch rainfall. It forms a small to medium-sized tree with an attractive weeping habit and decorative white flowers, being an excellent subject for windbreaks or shade trees. It appears to make its best growth over limestone.

THE OLIVE (*Olea europea*).

This is a useful small tree in many parts of the Slopes, particularly in the southern half, being a species which prefers a dry summer and a moderate winter rainfall. It withstands a good deal of heat and drought and makes an excellent hedge, standing pruning very well. It transplants rather badly from the open ground, and should be grown in containers to get the best results.

THE LEMON-SCENTED GUM (*Eucalyptus citriodora*).

This is a handsome species with clean straight stem, shapely crown, and sparse but attractive foliage. It is a native of coastal Queensland, and although doing best in warm coastal districts, appears to be adapted to various soils and climatic conditions outside its natural range. It probably is not very frost hardy, requiring some degree of protection, but appears to be fairly heat and drought resistant.

In the Slopes Division it makes moderately good growth at such places as Inverell and Merriwa.

It is essentially a tree for avenue and ornamental planting, as it is too sparse in the foliage for shade and shelter purposes. The leaves contain an oil consisting almost entirely of the aldehyde citronellal.

Miscellaneous.

The Willow (*Salix babylonica*) is grown along stream banks and is extremely useful for shade, shelter, and bank-binding purposes. (See *Agricultural Gazette,* October, 1927, page 746.)

The Almond (*Prunus amygdalus*) is grown in many parts a, a break, particularly for orchards, and is useful as a shade tree. It is fairly drought hardy, although doing best where a moderate rainfall is available, and is a useful tree for this Division.

The Walnut (*Juglans regia*) is also grown to advantage in some districts, particularly in the southern subdivision, where it is used chiefly as an orchard break. It may also be planted for shelter, shade and ornamental purposes, and yields a commercially valuable fruit. It prefers, however, a moderately cool climate with a fair average rainfall, and requires a fairly rich soil. It is a slow growing species.

The Tasmanian Blue Gum (*Eucalyptus globulus*), although typically a tableland species of cooler districts, has been established successfully in some districts, making its customary rapid growth. The majority of trees, however, have been only recently planted, and it remains to be seen whether this species is sufficiently hardy for the Division.

Elms (*Ulmus* spp.) do moderately well in the cooler, moister portions of the southern subdivision, making useful shade and shelter trees for paddocks, etc.

Poplars also are grown in a number of districts, and one or two of the Oaks, including *Quercus virginiana,* make fair development.

These three groups of trees, however, will be dealt with more fully under the Tableland Division.

In most parts it is found that the various Cypresses (*Cupressus* sp.) do not make satisfactory growth. *Cupressus arizonica,* however, is a handsome tree which is regarded as drought and frost hardy. In South Africa this species has been found to be more hardy than some of the Australian Cypress Pines (*Callitris* spp.), and it is worthy of a trial in the Slopes Division. The Busaco Cedar (*Cupressus lusitanica*) might be expected to do fairly well, and the Italian Cypress (*Cupressus sempervirens*) is long-lived, but very slow.

The Honey Locust (*Gleditschia triacanthos*) can be grown successfully in the more favoured portions of this division, particularly in the southern subdivision. A full description of this tree will be given when dealing with the trees of the Tableland Division.

Several of the Figs (*Ficus* spp.) are sufficiently hardy for parts of the division, and Mulberries and Loquats can also serve as shade and shelter trees.

The ornamental Jacaranda can be grown, but usually needs some protection from frost until established.

The Bunya Bunya (*Araucaria Bidwilli*), although a native of the Queensland rain forests, makes good growth, but can usually only be grown in parks or gardens, where a certain amount of artificial watering is available. The Hoop Pine (*Araucaria Cunninghamii*) is also grown, but only to a limited extent.

The so-called "Tree of Heaven" (*Ailanthus glandulosus*) grows in parts, but should be condemned owing to its free suckering habits.

The popular Brush Box (*Tristania conferta*), of coastal areas, is seen here and there, but requires some artificial assistance.

Hedges of Privet, Boxthorn or Oleander are not uncommon. The last-named species is poisonous to stock, and Boxthorn is regarded in many districts as a noxious weed. In other areas, however, it spreads very little, and is locally regarded as being very useful.

TREES RECOMMENDED FOR THE WESTERN SLOPES DIVISION.

In selecting species from these lists, reference should be made to the notes given previously on each species, and attention paid to particular requirements and features outlined therein.

Where conditions are very dry and approximate those of the Western Plains, the list of recommendations for that division should also be consulted.

Kurrajong (*Brachychiton populneus*) F.

Wilga (*Geijera parviflora*) F.

Myall (*Acacia pendula*) F.

*Yellow Box (*Eucalyptus melliodora*).

*White Box (*Eucalyptus albens*).

*Apple (*Angophora intermedia*) F.

Plane Tree (*Platanus orientalis*). Deciduous.

White Cedar (*Melia Azedarach*). Deciduous.

Drooping She Oak or Mountain Oak (*Casuarina stricta*) F.
Fuzzy Box (*Eucalyptus conica*).
Red Gum (*Eucalyptus dealbata*).
River Gum (*Eucalyptus rostrata*).
Sugar Gum (*Eucalyptus cladocalyx*).
*Red Stringybark (*Eucalyptus macrorrhyncha*).
Apple (*Eucalyptus Stuartiana*).
*River Oak (*Casuarina Cunninghamiana*) F. Along banks of streams.
Willow (*Salix babylonica*) F. Along banks of streams.
Cooba (*Acacia salicina*). Along banks of streams.
Tree Lucerne (*Cytisus proliferus*) F.
Pepper (*Schinus molle*).
*Almond (*Prunus amygdalus*).
*Walnut (*Juglans* spp.).
*Elms (*Ulmus* spp.).
*Camphor Laurel (*Cinnamomum Camphora*).
*Carob Bean (*Ceratonia siliqua*) F.
Agonis flexuosa.
Moreton Bay Fig (*Ficus* spp.).
Red Ash (*Alphitonia excelsa*). F. Northern subdivision.
*Insignis Pine (*Pinus radiata*).
*Stone Pine (*Pinus pinea*).
*Aleppo Pine (*Pinus halepensis*). On limestone.
*Cootamundra Wattle (*Acacia Baileyana*).
*Queensland Silver Wattle (*Acacia podalyriaefolia*).
Motherumbah (*Acacia Cheelii*). F. Northern subdivision.

Species marked with an asterick are, generally speaking, best adapted to the eastern half of the division, or where conditions are fairly favourable. Some of them require some artificial watering for successful establishment.

Fodder trees are marked F.

Windbreaks and Shelter Belts.

Group I—

*Kurrajong (*Brachychiton populneus*).
Wilga (*Geijera parviflora*).
Myall (*Acacia pendula*).
*Almond (*Prunus amygdalus*).
*Walnut (*Juglans* sp.).
*Olive (*Olea europaea*).
*Tree Lucerne (*Cytisus proliferus*).
Motherumbah (*Acacia Cheelii*).
*Carob Bean (*Ceratonia siliqua*).
Camphor Laurel (*Cinnamomum Camphora*).
Agonis flexuosa.
Pepper Tree (*Schinus molle*).
*Osage Orange (*Maclura aurantiaca*).
Cootamundra Wattle (*Acacia Baileyana*).
Some Cypresses. (See notes.)

Group II—

Insignis Pine (*Pinus radiata*).
Canary Island Pine (*Pinus canariensis*).
Aleppo Pine (*Pinus halepensis*).
Rivergum (*Eucalyptus rostrata*).
Red Gum (*Eucalyptus dealbata*).
Yellow Box (*Eucalyptus melliodora*).
White Box (*Eucalyptus albens*).
Apple (*Eucalyptus Stuartiana*).

Group I represents shorter growing species, and Group II taller ones. Those marked with an asterisk are the most suitable ones for orchard breaks.

Trees for Timber.

Hardwoods—

Ironbark (*Eucalyptus crebra*).

Red Stringybark (*Eucalyptus macrorrhyncha*).

River Gum (*Eucalyptus rostrata*).

Red Gum (*Eucalyptus Blakelyi*).

White Box (*Eucalyptus albens*).

Softwoods—

White Cypress Pine (*Callitris robusta*).

Insignis Pine (*Pinus radiata*). Only where conditions are favourable.

Canary Island Pine (*Pinus canariensis*). Only where conditions are favourable.

Trees for Fuel.

White Box (*Eucalyptus albens*).

Yellow Box (*Eucalyptus melliodora*).

Acacia spp., including *Acacia pendula* and *Acacia homalophylla*.

Oaks (*Casuarina Cunninghamiana* and *Casuarina Luehmanni*).

Belah (*Casuarina lepidophloia*).

(*To be continued.*)

Lamb Dipping Trial at Bathurst Experiment Farm.

The trial to ascertain whether the dipping of lambs had any effect on their growth was repeated this season at Bathurst Experiment Farm by Mr. A. K. Cantrill, Sheep and Wool Instructor. He reports as follows:—

Fifteen lambs were selected and divided equally into three lots. One lot was dipped in a carbolic dip, one in an arsenical powder dip and the third lot left undipped as a check. Fairly small lambs were selected so that they would not be sold in the first draft that went to market. The lambs were weighed prior to dipping and again on 9th January, 1929.

The average weights are shown hereunder: —

Weighed.	Carbolic Dip.	Arsenical Dip.	Check (undipped).
	lb.	lb.	lb.
5th December ...	64·2	65	64·4
9th January ...	77	72·8	74·6
Increase ...	12·8	7·8	10·2

None of the lambs suffered any ill effects. The lot dipped in carbolic made the greatest increase, while those dipped in the arsenic powder dip made the lowest gain. It cannot be definitely said, however, that this is the result of the dipping.

A Bottle Test for Detecting Certain Butter Defects.

W. S. SUTTON, B.Sc.Agr., Assistant Biologist.

In common with other milk products, butter is subject to several distinct types of deterioration. The standard of butter quality is assessed by expert graders, who may award points as follows:—

Flavour and aroma	50 points.
Texture (body and grain)	30 "
Condition (colour, packing and salting)	20 "
Total	100 points.

The quality of the butter is indicated by the number of points it receives, and may be classified in one or other of the following grades:—

Superfine	100–96 points inclusive.
Choicest	95–93
First grade	92–90
Second grade	89–86
Third grade	85–82
Pastry	81–75

Most of the specific defects are of known origin and may easily be remedied, so that when flavours, such as "tallowy," "metallic," "fishy," &c., develop, it requires but little investigation to ascertain the cause and little effort to prevent a recurrence of the trouble.

In recent years, however, there have been sporadic occurrences of a new odour of a highly objectionable nature in the butter of certain factories of this State. Butter having this defect, which is called by graders "decomposed" odour, may be classified as low as third grade. Two striking characteristics of "decomposed" odour are (1) the rapidity with which it may develop in a sample of butter apparently of satisfactory quality and (2) the apparent lack of correlation of the condition with bacteriological content as judged by numbers and types which develop on nutrient agar.

Examinations have been made in an effort to determine the cause of "decomposed" odour. During the course of this work one method proved extremely valuable in developing the odour in butter which appeared to be of satisfactory quality when submitted to the ordinary grading examination, but which was suspected to contain the trouble in a latent form. It had also been observed that odours of an unclean* nature sometimes became apparent in samples of butter homogenised for moisture examination. The homogenised condition is obtained by melting the butter slowly over a water-bath and shaking vigorously at frequent intervals during the melting process. When thoroughly melted, the butter is then quickly

*The term "unclean" is used throughout the article to describe any odour not thought to originate from changes in the fat. Where a butter is stated to have been unchanged, odours of fat origin may have been present but were not registered.

cooled. As the method which proved valuable in intensifying the decomposed odour was very similar to that employed in the preparation of the samples for moisture estimation, it was decided that more work should be done to ascertain if the treatment caused the development of the unclean odour in low-grade butters only.

The Standard Plate Method and the Bottle Test.

An experiment was therefore planned in which graded butters were examined for bacterial content by the standard plate method and the bottle test for the development of abnormal odour. The samples used were collected during the ordinary course of the routine grading of butter. No effort was made to sterilise the trier between boxes. The plugs from the trier were placed on clean non-sterile butter paper as used for the wrapping of one-pound blocks. At the laboratory, sterile utensils were used to take samples from the centre of the plugs in such a manner that the portion taken was not contaminated by the grading process. These samples were then diluted in sterile water at 40 degrees C. and after thorough mixing, water containing $\frac{1}{1000}$ gram of butter was placed in each of three tubes of beef extract agar (pH 7.2) and then poured into sterile petri-dishes. The plates were incubated for two days at 37 degrees C. and then for two days at room temperature (15 to 20 degrees C.). At the end of this period the numbers of colonies on the plates were counted and the number of bacteria per gram of butter calculated. On completion of plating, part of the remainder of the core—about 30 grams—was placed into a sterile 200 c.c. erlenmeyer flask, which was then partially submerged in a water bath at 40 to 50 degrees C. and agitated until the whole of the butter was melted. The cotton-wool plug was then removed from the flask and a sterile cork substituted. The flasks were then incubated at room temperature (15 to 20 degrees C. approximately) and examined at the end of one and seven days.

A control series of flasks was arranged by placing the remaining portions of the cores in similar flasks, which were then heated at 100 degrees C. for twenty minutes in the Arnold steriliser. There was no development of unclean odour in any of the control flasks. Fifty-seven samples were examined in the above manner. They were collected from eighteen factories and no two samples were of identical manufacture.

Data Obtained by the Use of These Methods.

A study of Table 1 will show that where the butter contained less than 100,000 bacteria per gram, twenty-nine samples in a total of thirty-seven failed to develop abnormal odour when submitted to the bottle test. It is a significant fact that six of the eight samples which developed an odour were taken from one particular factory that had been experiencing trouble with the quality of its butter. It seems, therefore, that the bottle test intensified some factor which was not demonstrable by the routine examination, and which was causing the deterioration of the butter of that factory.

Where the count ranged between 100,000 and 500,000 per gram, five samples showed unclean odour and five developed no change. Thus there was no tendency for any chance sample either to remain normal or to deteriorate. These apparent irregularities in results are probably to be explained by the type of flora present in a specific butter. If the flora consists of bacteria which have little action on butter it is unlikely that a change would occur. If, however, bacteria of a putrefactive nature are present they would almost certainly bring about noticeable changes.

TABLE 1.—Relationship between the Production of Abnormal Odours by the Bottle Test and the Number of Bacteria per Gram in the Butter.

Odour developed by samples.	Samples with less than 100,000 bacteria per gram.	Samples with 100,000 to 500,000 bacteria per gram.	Samples with over 500,000 bacteria per gram.
Unclean	8	5	9
Normal	29	5	1
Total	37	10	10

Where the total count was over 500,000 bacteria per gram, nine samples out of a total of ten developed unclean odour. Only one sample was unchanged. Here again it is possible that inert bacteria would fail to cause deterioration while objectionable types would attack the butter. However, when the count is high the probability of heavy initial contamination is greater, and thus the possibility of the presence of undesirable organisms is considerably increased.

Comparative Value of Data Obtained by Both Methods.

It is evident that when the count of bacteria per gram of butter is high, the bottle test confirms the conclusions that would have been formed as the result of a plate analysis. In samples where the numbers are not excessive and yet are above the average, the bottle test quickly differentiates between an inert and an undesirable flora, and such a determination could only be obtained after considerable study in the case of the plate method. Where the numbers of bacteria on a plate are comparatively low, thus suggesting that the butter is of good-keeping quality, the bottle test usually fails to produce changes, but in some instances it demonstrates poor keeping quality which would never have been suspected from the results of the plate examination. This latter observation has been amply justified by tests with "decomposed" odour during the season.

Bottle Test a Valuable Check on Practical Grading.

In addition to amplifying the results of the plate method as outlined above, the bottle test has proved a valuable check upon the results of practical grading. Two samples of butter which had been graded down to

85 and 87 points, respectively, failed to develop any abnormal odour when tested by the bottle method. This suggested that the trouble was not of biologic origin. This indication was supported by the fact that when plated each sample contained approximately 20,000 bacteria per gram (*cf.* 1 and 2 of Table 2). Further investigation by an officer of the Dairy Branch, Department of Agriculture, showed the trouble in these cases to be of chemical origin.

Other samples which had been graded choicest, deteriorated when submitted to the bottle test. These results were again supported by the plate method (Table 2).

TABLE 2.—Results of the Bottle Test Determinations Illustrating Relationship with Bacteriological Content and Lack of Agreement with Grade Points.

Sample.	Grade Points.	Number of bacteria per gram.	Bottle test.
1	85	22,000	Normal.
2	87	17,000	,,
3	93	300,000	Unclean.
4	93	1,200,000	,,
5	93	700,000	,,
6	94	780,000	,,

It is probable that these samples were contaminated during production, but that the short period between manufacture and grading, together with the inhibition of growth due to cold storage, was insufficient to permit serious biological activity. With the exception of those samples listed in Table 2 the results of the bottle test were in complete agreement with the quality awarded the butter by the graders.

Some Limitations of the Bottle Test.

Though the bottle test has been shown to be a valuable means of estimating the biological quality of butter, it is subject to certain disadvantages which will be difficult to overcome.

It is a well-established fact that "tallowy" flavour may be due to the activity of micro-organisms in the butter. With the bottle test the technique is such that "tallowy" odour frequently results when there is no reason to suspect that bacteria are connected with the phenomenon. Since the tallowy character does not always develop in the bottle test, it seems probable that the condition and chemical composition of the fats are of primary importance. Thus such odours as "stale," "rancid," "tallowy," &c., which are directly associated with the fat, cannot be regarded as reliable evidence of biological activity, though they may possibly offer some indication of the chemical stability of the butter-fat.

Where protein and sugar changes are concerned, *e.g.*, "musty," "high acid," "decomposed," "unclean," &c., the bottle test gives a highly valuable indication of biological contamination.

Suitability of Bottle Test for Factory Use.

At the present time the only method employed for the biological analysis of butter is the plate method, which is for the laboratory rather than the factory, as results are obtained slowly, the making of media and sterilisation of apparatus is tedious and fairly intricate, and the method is a technical one necessitating expert interpretation of results. In contrast to this, the bottle method is quick and fairly accurate, it requires simple apparatus and technique, and it gives results of such a definite character that they may be accepted in the absence of a complete bacteriological examination.

It is therefore suggested that this method would prove a valuable guide to butter factory managers who wish to keep a constant check on the biological quality of their product.

Summary.

1. Investigations with butter have indicated that melted butter sometimes develops very definite abnormal odours.

2. The technique of a bottle test for determination of the biological quality of butter is explained in detail.

3. Experiments showed that results of the bottle test confirm and supplement those obtained by the plate method.

4. In normal circumstances no odour developed when there were less than 100,000 bacteria per gram, and odour developed when there were more than 500,000 bacteria per gram. In specific instances the bottle test caused the development of odour in butter containing less than 100,000 bacteria per gram.

5. Butters, graded as "choicest," which are likely to develop biological flavours at a later stage, produce odours when submitted to the bottle test.

6. The method is particularly valuable for the detection of "decomposed" odour.

7. Odours due to changes in the sugar and protein are a more reliable indication of biological activity than those which originate from changes in the butter-fat.

8. The method is accurate, and is cheap, simple, and quick in operation.

9. It is recommended to managers of butter factories as a convenient means of checking the biological quality of their product.

In conclusion the writer wishes to acknowledge his indebtedness to Messrs. A. M. Brown, Senior State Grader, and S. R. Ballard, Dairy Instructor, who kindly collected and graded the butters used in these experiments.

Farmers' Experiment Plots.

WINTER GREEN FODDER TRIALS.

Far South Coast.

L. J. GREEN, H.D.A., Agricultural Instructor.

THE following farmers co-operated with the Department during the past season in conducting these trials :—

H. M. Sawtell, " Norira," Cobargo.
T. E. W. Irwin, Stoney Creek, Bega.
C. N. Squire, Springvale, Bega.
V. J. Collins, " Watoonga," Bemboka.

Green fodder crops are grown in this district solely for dairy cattle feed either for grazing off, or, if the season is a good one, excess areas are cut for hay. Winter grasses are unknown in far south coast pastures, with the result that after frosts all that remains is dry grass, mainly Paddock Love or Kangaroo, with a small amount of green picking around the base of the plants. Such conditions do not favour high milk yields, and to improve them it is necessary to have areas of winter fodder crops, winter grasses and clovers, or reserves of stored fodder in the form of silage to fall back on. A combination of the three, with perhaps most attention paid to sown winter pastures, silage and lucerne hay, will be found a sound recommendation to follow.

The cost of sowing a winter green fodder crop is on a par with sowing, say, an equal area of Wimmera Rye grass and Subterranean clover. The winter fodders have to be sown annually, whereas the sown pasture remains productive for many seasons from the one sowing. This is a strong economic consideration, and one well worthy of further thought by farmers before deciding upon next season's crops. It should not be misconstrued that it is best to sow the whole area with a suitable pasture. Better to sow half only of the intended area with grass and clover, and the remainder with oats, for preference. In regard to oats, it is a mistake to sow all Algerian, as is the common practice at the present time, but sow portion with an early variety, for which Buddah is recommended, and the remainder with Algerian. This will give continual grazing, whereas if a good early spring is experienced, the Algerian would come too late.

The Season.

The season was one in which any farmer who had given his land good preparation would have had little to fear. By preparation is not meant only the immediate preparation for a particular crop, but the previous cropping of the land, as it influences this sowing. To continue cultivating any of the

hill-land in this district for a lengthy period—with these particular trials some were sown on land that had been cropped continually for upwards of thirty years—is searching for trouble.

The granite hills with their open nature, coupled with heavy rains experienced, leach rather readily, and should not be cropped continuously for more than five years; they can then be laid down to pasture or lucerne, and brought back into cultivation after a further few years. Land fallowed for even three months, with the good rains experienced during February and March, would have given much better returns than those obtained in these trials.

In regard to fallowing, it is appreciated that a large area of the cultivable land in this district is situated on "sidings," and for that reason there is the possibility of heavy soil washing. However, there is still a considerable area that can be safely worked for a few months prior to sowing. When it is known that wheat farmers, with their large areas, at times running into hundreds of acres, find it profitable to plough nine months before sowing, and give their land as many as seven or eight cultivations, surely in this there is sufficient recommendation for coastal farmers to thoroughly work their infinitely smaller, yet just as important, areas to a greater degree than at the present time.

The appended rainfall chart describes the season very well—too much rain at planting, or if sown during late April, practically ideal conditions, followed by a dry spell, which, however, did not effect the plots owing to so much rain falling during February and March. Good rain fell during June, but so heavy in parts of the district as to set the ground. From this time onwards very dry conditions prevailed, and it was during this period that the earlier varieties showed their worth. Very few really profitable winter fodder areas were to be observed last season. The majority of these were on valuable land that should produce good winter crops with a minimum of preparation in almost any season.

RAINFALL.

Month.	Cobargo.	Bega.	Bemboka.
	points.	points.	points.
January	408	221	200
February	655	932	925
March	926	1,322	977
April	75	106	19
May	84	63	20
June	687	1,310	832
July	76	15	62
August	30	20	0
September...	99	90	43
October	90	111	42

Cultural Details.

Cobargo.—Soil worn out, open granite loam, previously cropped with oats for several years; mouldboard ploughed 15th April; harrowed twice 23rd April; disced twice and harrowed prior to sowing. Sown with wheat drill

on 27th April, oats 70 lb., wheat 60 lb., field peas 60 lb., and superphosphate 112 lb. per acre. The plot was moist and in good order at sowing time. This trial looked very well throughout the season, and it was anticipated that it would yield much better than it eventually did.

Stoney Creek.—Soil a medium to coarse granite loam, previously cropped with maize and oats alternately for several seasons, last crop maize. Mouldboard ploughed 30th March ; rolled and disced only prior to sowing ; sown on 30th April with wheat drill, oats 70 lb., wheat 90 lb., and superphosphate 112 lb. per acre. Cross harrowed after sowing.

Springvale.—Soil on the wheat plot was a fair quality granite loam, but for the oats was a worn out granitic clay. Previous cropping was maize and sorghum for fodder crops, and on the oat area they had been grown for over thirty years. Mouldboard ploughed 2nd April, and harrowed only. Sown broadcast on 6th April, wheat 120 lb., oats 120 lb., field peas 60 lb., and superphosphate 112 lb. per acre. The vetches were sown in rows 39 inches apart on 7th May at 20 lb. seed and 224 lb. superphosphate per acre.

Bemboka.—Soil fair quality granite loam, previously cropped for ten years with maize and oats, last crop maize in 1926–27. Ploughed July, 1927, grazed until early March, 1928, when it was ploughed again, and harrowed prior to sowing. Sown with wheat drill, oats 80 lb., wheat 80 lb., field peas 60 lb., and superphosphate 168 lb. per acre. Harrowed after sowing.

The plots at Cobargo and Springvale when just past flowering were cut for green weight, the one at Stoney Creek was grazed off to ascertain palatability, whilst the trial at Bemboka made insufficient growth to warrant harvesting.

YIELDS in Winter Green Fodder Trials.

Variety.	Springvale.		Cobargo.	
	Date Harvested.	Yield.	Date Harvested.	Yield.
Oats—	1928.	tons. cwt.	1928.	tons. cwt.
Buddah	31 Aug.	6 5	19 Sept.	6 3
Myall	,,	6 2	,,	6 3
Laggan	......	...	,,	5 14
Kelsalls	31 Aug.	5 0	......	...
Mulga	24 Sept.	6 2	2 Oct.	5 9
Sunrise	,,	5 4	19 Sept.	5 18
Guyra	,,	4 2	2 Oct.	4 15
Algerian	,,	4 14	,,	4 11
Wheat—				
Florence	2 Aug.	12 8	19 Sept.	2 14
Firbank...	31 ,,	6 17	,,	3 12
Gresley	,,	6 14	,,	3 8

The field peas, either when sown alone or in combination, made very little growth, and yields were not obtained.

The variety of vetch sown this season matures too late, and if this crop is of any value in this district an earlier variety, such as Woolly Podded, will have to be used. No green weights were obtained, but a small quantity of seed was harvested.

Grazing Trial.

A certain amount of interesting information was obtained from the grazing trial carried out at Stoney Creek.

On 31st July the plot was grazed with dairy cows. At this stage Guyra oats was looking very well, closely followed by Buddah and Mulga. Laggan also looked well, but was inferior to the others mentioned. The wheats did not give the appearance of being able to stand heavy grazing.

All the cereals were eaten readily, but the field peas were left until last. This is usual with this crop, however, and it was finally eaten out as cleanly as the others. Seventy cows fed on sorghum, lucerne chaff, and bran, when placed on this plot to graze for only half an hour daily, gave an increase of 15 gallons of milk per day. This increase disappeared immediately the cows were kept off the plot.

Remarks.

Results this season fully bear out Departmental recommendations, as the early varieties, themselves selections of Sunrise, which is a recognised good early variety, have outyielded it and also proven superior to Algerian. Laggan, a variety included for the first time, is a selection of Kelsalls. It looks particularly well in the field, and is invariably anticipated to yield more than it actually does. All the same it may prove a useful variety, but is inferior to Buddah, &c.

Wheats are an uncertain quantity for grazing, and should not be chosen in preference to oats.

Buddah, particularly, and Myall have shown their worth in previous seasons, and can be recommended as good early varieties. These should be sown, as advised earlier in the report, in conjunction with an area of Algerian.

The South Coast.

R. N. MAKIN, Senior Agricultural Instructor.

THE following farmers co-operated with the Department in carrying out experiments with winter-growing cereals suitable for green fodder during the 1928 season:—

C. T. Hindmarsh, Gerringong.
Geo. Langley, Albion Park.
J. W. Childs, Camden.
E. Hunt, Menangle.
A. Chittick, Kangaroo Valley.
J. W. Henry, Bolong.
A. C. Brown, Exeter.
The late Roy Garrad, Milton.

Generally, most unsatisfactory weather conditions were experienced. The Exeter and Milton plots failed owing to the adverse conditions, consequently no returns were obtained in those cases. Sowing was delayed in all cases on account of the wet state of the ground, due to heavy rain, which started in March and continued throughout the months of April and May.

The main object in cultivating winter cereals for green fodder is to endeavour to have a supply of succulent feed to follow on the green sorghum crops which are generally cut out in July, and just at this time of the year such green stuff is most valuable as the pastures are generally very scant. In order to supplement the pasturage it has been found that early varieties of oats and wheat are very useful, and to have them heading out at this time—July and August—it is very necessary that the sowing be made from mid-March to mid-April, otherwise the growth will not be satisfactory. Hence it is that in the 1928 experiments, the late maturity is due chiefly to the late sowing.

Cultural Details.

The soil conditions at the various centres are as follows:—

Gerringong.—Basalt formation; medium loam; flat; old cultivation.

Albion Park.—Sandstone formation; light loam formed from alluvial deposits; old cultivation.

Camden.—From Wianamatta shale; light loam; old cultivation; flat.

Menangle.—From Wianamatta shale; light loam; recent cultivation; hillside.

Kangaroo Valley.—From sandstone; light loam; old cultivation.

Bolong.—Alluvial deposit from sandstone; medium loam; old cultivation.

The land was ploughed and harrowed prior to sowing, and fertilised with superphosphate at the rate of 1 cwt. per acre. The rate of sowing was 2 bushels per acre where the seed was broadcasted and a little less at Bolong and Exeter where the plots were drilled. Field peas were sown at the rate of 30 lb. per acre mixed in with the other seed.

TABLE OF YIELDS.

	Gerringong.		Albion Park.		Camden.		Menangle.		Kangaroo Valley.		Bolong.	
	Yield.	Date of Harvesting.	Yield.	Date of Harvesting.	Yield.	Date of Harvesting.	Yield.	Date of Harvesting.	Yield.	Date of Harvesting.	Yield.	Date of Harvesting.
Wheat—	t. c.		t. c.		t. c.		t. c.		t. c.		t. c.	
Florence ...	5 14	18 Sept.	5 2	8 Oct.	11 2	14 Aug.	4 11	30 Aug.	7 0	15 Aug.	5 5	25 Aug.
Firbank ...	6 8	21 ,,	5 18	8 ,,	11 15	21 ,,	5 14	30 ,,	8 1	28 ,,	6 12	25 ,,
Gresley ...	5 11	18 ,,	5 8	20 ,,	8 17	29 ,,	...	...	7 15	28 ,,	5 4	14 Sept.
Gresley & Field Peas.	10 2	18 ,,	8 5	20 ,,	10 5	29 ,,	...	...	...	...	...	...
Oats—												
Buddah ...	5 8	5 Oct.	7 8	24 ,,	14 11	29 ,,	14 17	30 ,,	13 11	28 ,,	7 18	25 Aug.
Myall	4 11	9 ,,	6 17	24 ,,	12 17	29 ,,	14 17	30 ,,	8 8	10 Sept.	5 2	14 Sept.
Mulga	6 5	11 ,,	6 17	27 ,,	11 15	27 Sept.	7 10	1 Oct.	9 2	10 ,,	5 2	25 ,,
Sunrise ...	6 14	26 Sept.	3 18	30 ,,	21 14	27 ,,	8 0	30 Aug.	10 2	10 ,,	4 15	14 ,,
Sunrise & Field Peas (white).	8 14	5 Oct.	4 17	30 ,,	...	...	12 17	30 ,,	...	...	...	...
Kelsalls ...	3 4	26 Sept.	failed	...	11 15	29 Aug.	7 8	30 ,,	5 14	27 Aug.	failed	...
Guyra	6 0	9 Oct.	5 8	30 ,,	17 15	27 Sept.	5 14	30 ,,	5 7	18 Sept.	4 4	14 Sept.
Algerian ...	5 8	11 ,,	6 12	30 ,,	20 5	27 Oct.	6 13	5 Oct.	7 0	18 ,,	5 5	21 Sept.
Date of Sowing (1928).	26th May.		8th June.		31st March.		5th May.		9th April.		12th April.	
Rainfall (points) ...	2,054		1,580		1,497		......		2,312		......	

Former experiments proved the value of field peas grown in combination with wheat or oats, particularly if suitable varieties were selected and proper cultural methods adopted. It will be seen from the returns that satisfactory

increases were obtained in all cases where peas were included as compared with the sections sown without peas. Sunrise oats and Grey field peas, and Gresley wheat and Grey field peas are suitable mixtures, as the peas have about the same growth for the period, whereas earlier maturing varieties would require earlier maturing peas for maximum returns.

Comments on Varieties.

Although the season was not a favourable one, the early maturing oats yielded well in some districts. Buddah is becoming more popular every season. Kelsalls, an imported variety, has been grown next to Buddah for several years now in order to test the degree of resistance Buddah exhibits towards rust. Kelsalls, although a little earlier in maturing, will not be grown in future owing to its susceptibility to rust; this past season it failed entirely in two cases owing to rust, while on other plots it showed rust in a very pronounced form. Buddah has not yet exhibited any serious rust trouble and may be generally depended upon to give satisfactory results early in July if sown as advised. Mulga is also becoming popular. Myall may not be grown in future as it is not as satisfactory as Mulga for green fodder. Sunrise is very popular, and is a very valuable variety for green fodder, being reckoned a second early variety. Guyra and Algerian are, of course, grown for cutting in October and are two very useful varieties.

Of the wheat varieties, Florence, Firbank, and Gresley are very suitable for coastal conditions. Florence is very early, often beating Buddah oats by a few days. For the lighter soils and especially on hillside wheat crops are well worth growing.

Plants Proved to Possess Poisonous Properties.

The Poison Plants Committee of the Council for Scientific and Industrial Research has advised that specimens of *Eucalyptus corynocalyx* (sugar gum) from South Australia, and *Poranthera microphylla* from Hornsby, New South Wales, have been found to possess poisonous properties.

Air-dried leaves of *Eucalyptus corynocalyx* yielded 0.18 per cent. HCN (hydrocyanic acid), equivalent to 12.6 grains per pound weight, while the fresh plant of *Poranthera microphylla* yielded 0.018 per cent. hydrocyanic acid, equivalent to 1.3 grains per pound. On air drying, the plant lost 64.5 per cent. moisture. Calculated on the air-dried weight, the plant yielded 0.051 per cent. hydrocyanic acid, which is equivalent to 3.6 grains per pound.

List of Registered Farm Produce Agents.

A list giving the names and addresses of farm produce agents who had registered with the Department of Agriculture at 19th March, 1929, has been printed in leaflet form, and can be had on application to the Under Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney.

Manurial Experiments with Potatoes.

Grafton Experiment Farm.

R. J. DAVIDSON, H.D.A., Experimentalist.

With the object of determining the most profitable manurial treatment for potatoes, a trial was planted last season with various fertilisers. The season was very unfavourable for potatoes. Rainfall during the winter was ample, and the potatoes were planted in soil well supplied with moisture, but there was only one useful fall during the period of growth. This was in mid-October and amounted to 1 inch. Prior to this fall, the dry spell was making itself felt, and as it was followed by hot weather and strong drying winds the position was improved only temporarily. High temperatures were the rule during the growing season, up to 105 degrees being registered. The rainfall was as follows :—

On Crop.

March (from 15th) ...	304 points.	August	63 points.
April	688 ,,	September	24 ,,
May...	272 ,,	October	146 ,,
June	398 ,,	November (to 15th) ...	24 ,,
July	291 ,,		
		Total on 18 wet days. ...	257 ,,

The trial was located on alluvial soil with a few clayey patches. The land had been under lucerne for three years. It was disc-ploughed on 15th March, disc-harrowed on 12th April and 18th May, disc-ploughed on 28th May, disc-harrowed on 8th June, harrowed on 11th June, disc-ploughed on 13th July, and again disc-harrowed on 24th July and 30th July. Planting took place on 31st July, the variety used being Factor, obtained from Mr. W. J. McPaull, Taralga, winner of the R.A.S. Southern District Potato-growing Competition. It was very good seed, sound, and commencing to shoot. The sets, mostly whole, were ploughed in, 4½ inches deep, in every third furrow, the rows being 33 inches apart, and the fertilisers were sown in the drills. All plots were lightly harrowed after planting. Germination was good and even. The trial was harrowed on 14th August, inter-row cultivated on 11th September, and inter-row cultivated and hilled with mouldboard tines on the cultivator on 8th October.

Growth was backward owing to dry hot weather. There was insufficient moisture in the soil to dissolve the fertiliser. Leaf roll, a virus disease, affected about 1 per cent. of the crop, and early leaf blight (*Macrosporium solani*) made its appearance. Potato moth (*Lita solanella*) appeared in large

numbers early in November, and as the haulms were dying off the crop was harvested on 15th November. Following are the results :—

Treatment.	Yield per acre.	Increase.	Value of Increase.†	Cost of Increase.†	Net Gain.
	t. c. qr. lb.	c. qr. lb.	£ s. d.	£ s. d.	£ s. d.
280 lb. superphosphate	4 1 2 1	10 3 14	4 7 0	0 19 6	3 7 6
*280 lb. M22	3 19 0 12	8 1 25	3 7 10	1 3 3	2 4 7
*466 lb. P16	4 2 0 24	11 2 9	4 12 8	2 9 10	2 2 10
560 lb. superphosphate	3 19 0 12	8 1 25	3 7 10	1 17 0	1 10 10
*373 lb. P14	3 17 2 14	6 3 27	2 16 0	1 15 0	1 1 0
No manure (average of check plots).	3 10 2 15	......	......	......	......

* P14 consists of 3 parts superphosphate and 1 part sulphate of potash ; P16 consists of 3 parts superphosphate 1 part sulphate of potash, and 1 part sulphate of ammonia ; M22 consists of equal parts superphosphate and bonedust.

† In computing the value of increase in the above table, potatoes were valued at £8 per ton ; in estimating the cost of increase, superphosphate was valued at £7 per ton, sulphate of ammonia at £18 per ton, sulphate of potash at £18 10s. per ton, and bone dust at £10 per ton. The cost of applying fertiliser was estimated at 2s. per acre.

About 35 per cent. of tubers were unmarketable owing to small size, second growth, and damage by potato moth. All fertilisers gave a profitable increase in yield, and the biggest tubers were obtained from the manured plots. It will be seen that the complete fertiliser, P16, gave the highest yield, but that superphosphate at 2½ cwt. per acre was the most profitable.

The Limited Usefulness of Soil Analyses.

There is a rather widespread belief that a chemical analysis is the only step necessary to determine the correct fertiliser to use on a soil or the crops to which it is best suited, writes Dr. R. W. Ruprecht, Chemist of the Florida Experiment Station, in *The Citrus Industry*. In pointing out that this belief is far from correct, he voices the opinions held by experts of the New South Wales Department of Agriculture.

Dr. Ruprecht goes on to say that almost every day he receives samples of soil with requests for chemical analyses, and while his institution is glad to render this service to Florida farmers when there is an indication that some real service is being given, in most cases very little benefit is derived.

A chemical analysis of soil simply shows the total plant food contained in the soil. It does not state how much of this plant food is available for the use of the plant. Since this is what the farmers really want to know Dr. Ruprecht suggests a more practicable method of getting this information. Better than a soil analysis is to get the County Agent to look over the field, says Dr. Ruprecht. Since the agent is better acquainted with local conditions, he will be in a better position to advise as to the crops suited and the fertilisers needed.

If we insert the words "Agricultural Instructor" in place of "County Agent," for the County Agent in U.S.A. occupies a somewhat similar position to the Agricultural Instructor in this State, the paragraph very well expresses the attitude of the New South Wales Department towards soil analyses.

Farmers' Experiment Plots.

WHEAT, OATS AND BARLEY EXPERIMENTS, 1928.

South-western District.

G. NICHOLSON, H.D.A., Agricultural Instructor.

THE following farmers conducted experiments with wheat and oats, in co-operation with the Department, during 1928:—

G. P. Circutt, "Uabba," Lake Cargelligo.
T. W. Turner, "Kia-Ora," Lake Cargelligo.
H. J. Harley, "Wattle Park," Tullibigeal.
J. Dillon, "The Pines," Tullibigeal.
D. N. Johns, "Wollongough," Ungarie.
D. and J. Gagie, "Spy Hill," West Wyalong.
H. S. Barron, Bunda, via Merriwagga.
G. Gow, "Hughendon," Barellan.
H. T. Manning, "Ravenstone," Barellan.
P. Corcoran, "Weeroona," via Moombooldool.
A. H. Jennings, Colinroobie, via Barellan.
H. Sheldrick, "Glenariff," Ardlethan.
M. McCrone, "Bungambil," Mirrool.
D. S. Adamson, "Mindarie," Dirnaseer.
A. H. Atkinson, "Glen Lyn," Quandialla.
R. Penfold, "Edaville," Quandialla.
P. Coelli, "Bindawalla," Berendebba.
W. Hubbard, "Creggie-Lea," Tallamba.
S. Kanaley, "Lynton," Junee.
H. V. May, "Caithness," Junee.
H. Rumble, Carinya, Muttama.
G. H. Coddington, "Granite View," Murrumburrah.
Hobson Brothers, "Glen-Lea," Cunningar.
R. H. Thackeray, "Wootoona," Young.
S. A. Chapple, "Ondiong," Kingsvale.
J. E. Dodds, "Greenlands," Bethow.

Owing to the depredations of grasshoppers from the time of germination until June, the plots sown on the property of Messrs. D. and J. Gagie were completely destroyed. No results are available from Mr. S. Kanaley, Lynton, Junee, owing to the mistake of an employee at harvest.

The Season.

Each season has its own peculiarities, no two being exactly alike, and few, if any, perfect in every detail. Conditions prevailing during the past season, however, were anything but normal. Reviewing the period for both the fallow and crop, the outstanding features were a wet spring in 1927, torrential rains during the first three months of 1928, grasshopper swarms in plague numbers during the seeding period (western districts only), a mild and comparatively dry winter, and an early harvest. The winter of 1927 enabled fallows to be ploughed early, and the bounteous spring rains

provided an excellent opportunity of working fallows to advantage prior to harvest. During the early part of 1928 the fallows received a thorough soaking, as a result of torrential rains over the greater part of the south-west. At the same time considerable damage resulted from soil erosion, and fallows were temporarily thrown out of condition. Ideal weather prevailed during the seeding period. From March until June grasshopper swarms were particularly active in the Tullibigeal, Wyalong, Barellan, and Ardlethan districts, doing considerable damage to early-sown crops.

As a result of the mild winter, and sufficient rain to meet immediate requirements, crop prospects by August were particularly bright. Little rain of any consequence fell during September and incessant hot and boisterous winds prevailed, consequently crops suffered a check, particularly the later sown crops. Light showers fell during October, conditions were cooler, and the crops made a remarkable recovery and finished well ahead of expectations. Throughout harvesting ideal weather was experienced, and the sample of wheat was of excellent colour, well filled, and of good weight.

Comparing the rainfalls of 1927 and 1928 for the growing period, the aggregate falls for the past season are in many instances lower than those of 1927, which was regarded as a dry year; but in 1927 many areas of wheat were sown on a dry seed bed, whereas this season most fallows were well charged with moisture in April. In the Hillston district crops as a whole were comparatively light, although the rainfall from April to October compared favourably with that of other western districts. The autumn rains, however, were the lowest recorded in the south-west sections of the district, but as the result of isolated heavy thunderstorms crops well up to the average were produced.

The past season was an early one, and farmers who sowed early scored. Even early-maturing varieties sown under favourable conditions during the latter part of May were disappointing. The greater number of the experiment plots were sown in May, consequently yields were not up to expectations. Delay in sowing was due partly to grasshoppers in affected areas, but mainly to late delivery of seed.

Cultural Details.

Lake Cargelligo (G. P. Circutt).—Red light deep loam; third crop 1928; mouldboard-ploughed 4 inches August, springtoothed deep October, springtoothed late January, 10th February, 23rd February, twice March, once April; sown with combine 1st and 2nd May on a patchy seed-bed, 60 to 65 lb. seed and 56 lb. suprphosphate. Irregular and patchy germination.

Lake Cargelligo (T. W. Turner).—Medium heavy red loam; third crop 1928; failed 1927; springtoothed twice March, once in April; sown with disc drill 2nd May on a moist seed-bed, with 52 lb. seed and 56 lb. superphosphate. Early Bird pinched, too far advanced to benefit from October rains.

Rainfall Records.

Month.	Lake Cargelligo (G. P. Circuitt).	Lake Cargelligo (T. W. Turner).	Tullibigeal (H. J. Harley).	Tullibigeal (J. Dillon).	Ungarie.	Merriwagga.	Barellan (G. Gow).	Barellan (H. T. Manning).	Moombooldool.	Colinroobie.	Ardlethan.	Mirrool.	Dirnaseer.	Quandialla (A. H. Atkinson).	Quandialla (R. Penfold).	Berendebba.	Junee.	Muttama.	Murrumburrah.	Cunningar.	Young.	Kingsvale.
1927—	points.	points.	points.	points.	points.	points.	points.	points.	points.	points.	points.	points.	points.	points.	points.	points.	points.	points.	points.	points.	points.	points.
June ...	26	26	63	63	89	...	61	49	150	...	...	41	89	46	...	46	83	79	157	79	66	79
July ...	83	83	44	46	35	...	98	120	117	...	...	109	140	75	...	75	128	163	158	158	164	158
August ...	90	90	84	80	42	...	128	87	78	...	...	68	153	53	..	53	152	147	221	209	83	166
September ...	129	280	120	121	145	...	71	70	117	..	.	45	29	93	..	193	191	110	66	53	168	221
October ...	158	158	204	202	219	...	314	226	227	..	...	315	319	209	...	209	167	108	328	355	210	328
November ...	117	117	136	137	142	...	48	51	50	..	..	86	148	223	...	223	119	308	340	373	240	340
December ...	12	12	28	30	27	...	50	60	59	..	...	7	106	23	...	23	Nil	59	130	90	17	48
1928—																						
January ...	150	300	621	612	644	265	301	280	282	...	381	490	480	446	476	416	356	250	139	165	403	196
February ...	503	664	746	636	1,278	175	454	501	529	..	620	663	640	446	629	480	562	287	394	407	589	371
March ...	316	271	275	315	276	173	374	337	229	..	326	355	534	287	398	353	242	258	320	328	293	416
Total Fallow Period ...	1,584	2,001	2,321	2,242	2,897	...	1,899	1,781	1,838	...	.	2,169	2,638	1,901	...	2,071	2,000	1,869	2,253	2,212	2,233	2,323
April ...	110	103	100	92	161	137	187	149	109	184	208	111	158	243	261	226	306	248	307	249	369	276
May ...	115	71	52	74	94	138	139	70	108	72	63	61	113	65	53	66	97	101	65	120	102	122
June ...	139	148	59	72	142	98	51	56	23	62	42	73	153	105	139	148	94	148	161	238	90	198
July ...	243	238	206	211	191	106	135	137	159	149	141	168	250	176	223	213	262	249	209	260	287	314
August ...	Nil	14	28	34	37	24	45	40	62	47	64	45	137	137	115	131	88	122	67	120	91	74
September ...	56	43	45	43	32	63	35	9	58	45	45	47	65	48	26	41	98	99	46	64	80	88
October ...	180	156	66	72	53	60	94	71	60	100	59	59	134	64	83	77	270	160	60	121	126	122
Total growing Period ...	843	773	556	598	710	626	686	541	579	659	622	566	1,010	838	900	902	1,215	1,087	1,005	1,172	1,145	1,194

Tullibigeal (H. J. Harley).—Medium heavy red loam, new land; disced 3 inches in August, springtoothed September, scarified October, November, December, January, February, and April; sown with hoe drill 19th and 20th April on a moist and excellent seed-bed, 50 to 60 lb. seed and 70 lb. superphosphate. Plots eaten out with grasshoppers three times; partly destroyed Ephos plot and Canberra completely destroyed.

Tullibigeal (J. Dillon).—Red medium loam; sixth crop 1928; fallowed 1926 but not sown, springtoothed October, November, harrowed January, disced February; sown with combine 29th May on a moist and good seed bed, 45 to 60 lb. seed and 70 lb. superphosphate. Sowing delayed on account of grasshoppers. All varieties broke down badly.

Ungarie.—Heavy red loam, stiff clay subsoil, cropped since 1895; scarified February, May; mouldboard-ploughed 3½ inches July, springtoothed October, scarified January, March, harrowed April, springtoothed May; flooded country; sown with disc drill 3rd and 4th May on a moist seed-bed with 65 lb. seed and 56 lb. superphosphate. Manurial trial destroyed by grasshoppers.

Merriwagga.—Deep-red sandy loam; first crop, 1927, failed; springtoothed February and April; sown with combine 10th May in a moist seed-bed, 60 lb. seed and 56 lb. superphosphate.

Barellan (G. Gow).—Heavy brown self-mulching clay, boree country; mouldboard-ploughed 3½ inches January, disc cultivated June, harrowed January, springtoothed February and May; sown with combine on a moist seed bed 16th and 17th May, 75 lb. seed and 56 lb. superphosphate. Flooded country. Late varieties tipped badly.

Barellan (H. T. Manning).—Medium heavy red loam, old land; disc-cultivated 3 inches July, springtoothed October, harrowed January, springtoothed February and April; sown with combine 21st May on a good moist seed-bed, with 70 lb. seed and 84 lb. superphosphate. Union, Nizam, and Federation badly affected with flag smut.

Moombooldool.—Red light sandy Mallee; third crop 1928; mouldboard-ploughed 3½ inches July, springtoothed March; sown with combine 15th May on a moist and open seed bed, with 65 lb. seed and 112 lb. superphosphate; oats sown 16th May, 70 lb. seed and 100 lb. superphosphate.

Colinroobie.—Red medium loam; sixth crop 1928; disced 3 inches February, scarified August, springtoothed twice February, scarified May, springtoothed May; sown with disc drill in a good moist seed-bed on 16th and 17th May, with 75 lb. seed and 84 lb. superphosphate; oats 60 lb. seed. Plots in August very dense and thick, but burnt off badly.

Ardlethan.—Medium heavy red loam; seventh crop 1928; springtoothed February, disc-cultivated 3 inches June, scarified October, springtoothed January, February, scarified March, harrowed March, scarified May; sown with disc drill in a moist seed bed 17th May, late wheats 53 lb. seed and 84 lb. superphosphate 30th May, early wheat 75 lb. seed. Federation and Union affected with flag smut.

Mirrool.—Medium heavy red loam, old land out for eight years; disced 1926, scarified June, 1927; disced October, April; scarified and harrowed in April; sown with disc drill 25th April, 55 lb. seed and 84 lb. superphosphate. Eaten off by grasshoppers. Bena badly damaged.

Dirnaseer.—Medium heavy red loam, old cultivation; mouldboard-ploughed 4 inches July and August, springtoothed deep November, springtoothed January, March, harrowed March, springtoothed April; sown with combine 21st May on a moist seed-bed, 75 lb. seed and 84 lb. superphosphate.

Quandialla (A. H. Atkinson).—Heavy black Gilgai clay; first crop, 1926, failure; mouldboard-ploughed 3½ inches June; springtoothed July, September; scarified November, January; disced April; scarified May; sown with combine 7th and 8th May, on a faulty seed-bed with 60 to 65 lb. seed and 56 lb. superphosphate. Patchy germination due to uneven country. Plots eaten bare by grasshoppers. Indications of rust infection, but not serious.

Quandialla (R. Penfold).—Light sandy loam to heavy semi self-mulching, black clay; cropped since 1915; mouldboard-ploughed 3½ inches August; scarified October; harrowed twice February; scarified March, April; sown with combine on a good seed-bed 9th May, 50 to 60 lb. seed and 56 lb. superphosphate. Superior crop and oats better filled on the heavy country.

Berendebba.—Medium to medium heavy brown loam; eight previous crops; mouldboard-ploughed 4 inches July; springtoothed September; harrowed November; springtoothed January; harrowed February; scarified March; springtoothed May; sown with combine 9th and 10th May on a good moist seed-bed, 60 to 65 lb. seed and 56 lb. superphosphate. Excellent germination.

Tallimba.—Light to medium red loam; cropped fourteen years; mouldboard-ploughed 3½ inches July; harrowed October; springtoothed February; heavily stocked; sown with combine on a moist and excellent seed-bed 26th and 27th April, 60 lb. seed and 60 lb. superphosphate. Plots burnt off badly. Gresley, Duri, Gluyas, and Waratah exhibited weakness of straw, straw bending and snapping off near the nodes.

Junee.—Light brown friable granitic loam; old cultivation; mouldboard-ploughed 4 inches June; harrowed July; mouldboard-ploughed 4 inches February; harrowed March; springtoothed April; sown with combine in a loose moist seed-bed 23rd May, 50 to 60 lb. seed and 65 lb. superphosphate.

Muttama.—Grey light friable loam; very old cultivation; mouldboard-ploughed 4½ inches August; harrowed September; disced January; springtoothed February; disced May and harrowed; sown with disc drill on a moist open seed-bed; wheats 19th May, 70 lb. seed, 84 lb. superphosphate; oats 21st May; 60 to 70 lb. seed and 84 lb. superphosphate.

Murrumburrah.—Light friable brown loam; very old cultivation; constant cropping; mouldboard-ploughed 4½ inches July; springtoothed October, January, February; sown with combine on a moist seed-bed 24th April, 70 lb. seed and 84 lb. superphosphate. Yield of Rajah reduced due to shelling.

Cunningar.—Red sandy granitic loam; cropped fifteen to sixteen years; mouldboard-ploughed 4½ inches August; springtoothed November, January; scarified March; springtoothed April, May; sown with disc drill 25th May, 80 lb. seed and 84 lb. superphosphate. Moist seed-bed.

Young.—Light brown friable loam; old cultivation; mouldboard-ploughed 4½ inches August; harrowed October; scarified January, March, May, and harrowed; sown with hoe drill 28th and 29th May on a moist seed-bed: wheat, 80 lb. seed, and 84 lb. superphosphate; oats, 45 to 70 lb. seed and 65 lb. superphosphate.

Kingsvale.—Light brown granitic loam; cropped continuously for nine years to 1926; mouldboard-ploughed 5 inches July; harrowed October; disced November, March; harrowed and springtoothed April; sown with disc drill 23rd and 24th April, on a moist open seed-bed; 45 to 65 lb. seed and 90 lb. superphosphate; kept and fed off until 9th August.

Batlow.—Red volcanic loam; cropped since 1923; potatoes and oats; Sudan grass, 1927; mouldboard-ploughed 6 inches March; harrowed and cultivated; sown 9th May in a moist seed-bed, 80 lb. seed and 84 lb. superphosphate. Irregular and patchy growth.

Diseases.

In no series of plots did the disease factor assume serious proportions. The varieties as a whole were very free from infection. As in former years, flag smut accounted for a greater reduction of yield than all other diseases combined. The general sowing on a moist seed-bed probably helped to minimise the infection, but on the other hand dry spring conditions favoured the full development of flag smut on affected plants. Of all the varieties under review, only one is highly resistant, namely, Nabawa. This variety appears to be immune from flag smut. Wandilla, Yandilla King, Gresley, Esquisite, Currawa, and Penny exhibited a fair amount of resistance, but were by no means immune. Federation, Union, Binya, Canberra, Duri, Bald Early, Bena, Ford, Turvey, Nizam, Marshall's No. 3, and Ranee were all very subject to attack.

All wheats were apparently free from bunt. Indications of rust attack were in evidence, principally in the later districts (Muttama, &c.), but not of a serious nature. Had the spring months been wet there is little doubt that this disease would have ruined many crops. The degree of resistance was not very marked, varieties sown under similar conditions showing very much the same amount of susceptibility.

Varieties.

Waratah continues to maintain pride of place as the standard early maturing variety for the earlier districts. Probably on account of its popularity, it is subject to more condemnation than any other well-known variety. It has yielded consistently again this season, and of the newer early-maturing varieties Bobin appears to be the only serious competitor.

RESULTS of Wheat Variety Trials.

Variety.	L. Cargelligo (G. P. Circuit).	L. Cargelligo (T. W. Turner).	Tullibigeal (H. J. Harley).	Ungarie.	Merriwagga.	Barellan (G. Gow).	Barellan (H. T. Manning).	Moombooldool.	Colinroobie.	Ardlethan.	Mirrool.	Dirnaseer.	Quandialla (A. H. Atkinson).	Berendebba.	Tallimba.	Muttama.	Murrumburrah.	Cunningar.	Young.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Bald Early ...	...	...	...	...	...	...	...	...	...	14 29	...	...	...	...	...	...	...	...	...
Bena ...	14 0	...	...	...	...	18 5	...	...	...	...	15 6	26 42	20 14	...	...	24 23	23 32	22 58	21 35
Binya ...	10 30	...	...	...	...	...	13 0	...	...	...	...	...	...	...	...	...	...	...	...
Bobin ...	...	...	18 48	31 43	...	...	...	...	16 32	17 4	...	...	...	...	...	...	...	...	...
Boolaroo ...	...	18 24	...	...	...	...	...	15 7	...	...	20 17	...	...	...	...	...	...	...	...
Boonoo ...	...	14 39	21 6	...	...	...	...	13 35	...	...	...	...	...	...	...	...	...	...	...
Bredbo ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	23 36
Cadia ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	20 24	...	...	20 12
Canberra ...	15 29	...	...	...	0	...	13 41	...	...	...	...	...	...	...	...	...	...	...	...
Canimbla ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	21 55	...
Currawa ...	...	...	...	...	...	...	...	14 6	...	...	...	...	...	...	...	22 8	...	...	...
Duri ...	14 46	...	...	...	...	...	16 39	...	...	...	21 42	...	...	24 53	15 27	...	...	...	...
Duchess ...	...	...	...	...	...	19 25	...	...	...	...	...	...	...	...	...	...	24 50	...	19 12
Early Bird ...	...	19 52	...	...	49	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Exquisite ...	...	...	...	...	...	...	...	...	...	...	...	30 55	...	...	...	...	...	...	19 42
Federation—																			
(N.S.W.) ...	12 24	20 17	19 37	26 40	43	21 36	12 27	...	9 7	12 43	27 9	...	17 50	...	12 10	...	...	...	...
(Vic.) ...	...	...	20 5	29 37	...	19 37	...	...	...	...	...	...	...	...	...	...	...	...	...
Ford ...	...	...	...	...	...	18 13	...	...	...	...	...	...	18 13	...	...	...	...	...	...
Gluyas Early	...	...	...	...	...	...	...	...	...	14 48	...	...	...	21 7	13 41	...	...	...	22 19
Gresley ...	...	...	...	...	33	...	...	...	...	...	...	...	...	25 57	13 54	...	...	...	...
Marshall's No. 3	...	...	...	...	...	...	...	...	...	...	...	29 36	19 19	...	...	22 58	...	22 16	...
Merredin ...	...	...	...	...	...	...	...	...	...	...	...	...	...	22 21	...	...	...	...	...
Nabawa ...	...	...	...	31 12	...	...	16 0	13 32	11 53	...	...	...	...	25 26	...	...	...	...	...
Nizam ...	...	15 47	...	...	...	...	11 50	...	9 7	...	...	...	18 27	...	11 41	...	...	...	...
Penny ...	...	...	19 38	...	...	...	...	15 11	...	...	...	...	...	...	...	...	22 0	...	...
Quality ...	...	...	...	...	...	...	...	...	...	...	...	...	...	21 34	...	...	...	...	...
Rajah ...	...	...	...	...	30	23 24	...	...	...	...	...	26 25	...	...	...	...	20 40	21 36	...
Ranee ...	...	...	...	26 25	43	...	...	...	16 35	...	...	...	...	23 29	...	...	...	...	...
Turvey ...	...	...	...	...	...	17 55	...	...	...	...	...	20 48	14 0	...	...	22 14	...	19 15	22 1
Union ...	14 58	19 22	...	30 53	43	...	9 20	...	...	12 11	17 24	...	16 5	19 30	11 59	...	...	...	...
Wandilla ...	...	...	...	...	...	...	...	...	...	...	...	21 7	14 50	...	...	18 32	...	20 23	...
Waratah ...	17 38	21 23	18 36	28 27	20	...	...	16 11	13 27	14 49	17 11	...	...	25 39	14 11	...	...	...	...
Yandilla King	...	...	...	...	...	...	...	...	...	...	...	29 34	17 8	...	...	22 52	19 44	21 57	21 39

Duri, which exhibits similar varietal characteristics to Canberra, gave fairly satisfactory results.

Early Bird was tried at two centres in the early districts, and gave excellent results, seasonal conditions being in its favour. At Lake Cargelligo it did not derive the same benefit from the October rains as the later-maturing varieties, being too far advanced.

Bena is not a good variety to withstand harsh conditions, and, in addition, is very susceptible to flag smut. On this account it cannot be recommended for the drier districts. At present the type is distinctly variable, but if a fixed strain can be evolved it is an excellent mid-season variety for the later districts.

Bredbo, a selection from Bena, was tried at only one centre, and compared more than favourably with Bena.

Of the lesser known varieties, *Duchess*, *Exquisite*, and *Ford* appear promising and are worthy of further trial.

Nizam gave disappointing results, and is as susceptible to flag smut as Federation.

Rajah, an early maturer, was only compared with mid-season and late-maturing varieties. On this account seasonal conditions favoured it. Rajah shows a tendency to straw weakness and is subject to shelling.

Wandilla failed to stand up to the dry conditions and tipped badly.

Nabawa, on account of its resistance to flag smut, will prove an excellent variety for early and mid-season sowing in flag-smut affected districts.

Some difference of opinion exists as to which is the best strain of Federation—New South Wales or Victorian. The two strains were tested at three localities. At two of these the Victorian strain proved superior. The averages for the three trials are:—Federation (Victorian strain), 23 bus. 6 lb.; Federation (New South Wales strain), 22 bus. 38 lb.

Fertiliser Trials with Wheat.

Substantial increases in yield accruing from the application of heavy dressings of superphosphate were not obtained. Some of the results are very interesting, however, and give an indication of the benefits obtained from the use of superphosphate in a dry year. At Merriwagga an application of 56 lb. superphosphate gave a yield of 12 bus. 20 lb., as against 7 bus. 35 lb. for no manure, and this under very dry conditions and on new land. Had a little more rain fallen early in the spring there is every reason to believe that the results would have been even more striking.

Results indicate that in the very early districts from 50 to 60 lb. superphosphate is about the correct application. In the slightly later districts, and on land which has been under cultivation for some years from 50 to 60 lb. is sufficient on the heavier types of soil. On the lighter soils the application can be profitably increased by 20 to 25 lb. In the later districts about 80 lb. superphosphate is recommended. These recommendations apply only to well-worked fallow.

Results of Fertiliser Trials.

Fertiliser per acre.	Lake Cargelligo. (G. P. Circuitt).	Lake Cargelligo (T. W. Turner).	Tullibigeal.	Moombooldool.	Merriwagga.	Barellan (G. Gow).	Barellan (H. T. Manning).	Colinroobie.	Ardlethan.	Mirrool.	Dirnaseer.	Quandialla.	Berendebba.	Tallimba.	Muttama.	Marramburrah.	Cunningar.	Young.
Variety ...	Federation.	Federation.	Waratah.	Currawa.	Waratah.	Federation.	Federation.	Waratah.	Federation.	Federation.	Yandilla King.	Bena.	Waratah.	Federation.	Yandilla King.	Bena.	Yandilla King.	Yandilla King.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Superphosphate—																		
182 lb. ...	...	...	...	15 19	...	...	...	...	...	...	...	...	...	...	...	...	...	...
168 lb. ...	...	...	18 57	15 0	...	...	...	...	11 16	...	...	...	...	...	...	...	...	...
126 lb. ...	14 12	...	...	...	...	...	...	...	...	...	...	20 9	...	...	22 50	...	...	21 59
112 lb. ...	...	14 11	20 22	14 6	11 42	21 10	15 40	14 32	13 43	...	30 11	...	27 0	13 20	...	24 16	...	...
98 lb. ...	12 51	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	22 35	...
84 lb. ...	...	19 32	19 6	...	11 57	19 27	12 27	13 27	12 43	27 9	29 34	19 25	27 29	12 30	22 52	23 32	21 57	21 39
70 lb. ...	12 48	...	18 36	...	...	...	...	...	...	26 0	...	...	...	...	...	...	...	...
56 lb. ...	12 24	20 17	...	...	12 20	21 36	8 32	14 58	12 4	23 40	28 3	20 4	25 39	12 10	21 46	24 27	1[illegible] 16	19 42
No manure ...	...	...	17 32	...	7 33	...	...	...	...	...	...	...	...	...	...	...	...	...
M17, 150 lb. ...	...	...	...	13 11	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Sphos phosphate, 84lb.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	20 4	...	...

Superphosphate encourages a deep and vigorous root system, resulting in a healthy virile plant, showing greater resistance to disease. Heavy dressings of superphosphate tend to check flag smut. The Federation plots on Mr. H. T. Manning's property at Barellan were badly affected by flag smut, but those receiving a heavier dressing of superphosphate were less infected and gave increased yields.

To ascertain the value of Ephos phosphate as compared with ordinary superphosphate three trials were sown. Unfortunately, two of these were damaged by grasshoppers, and no results are available. At no time during growth did the wheat manured with Ephos show to advantage. The plants lacked the characteristic vigour during the early stages of growth which is usually associated with wheat fertilised with superphosphate. At Murrumburrah 56 lb. superphosphate gave a yield of 24 bus. 27 lb., and 84 lb. Ephos, 20 bus. 4 lb.—a difference of 4 bus. 23 lb. in favour of superphosphate. Similar results were obtained at West Wyalong in 1927.

Rate of Seeding Test.

A rate of seeding test was conducted with Yandilla King on Mr. G. H. Coddington's property at Murrumburrah. Germination was uniform throughout all plots. Outside influences partly affected the growth of the two lighter-seeded plots. The results were as follows:—

Amount of seed per acre.	Yield per acre. bus.	lb.
42 lb.	17	10
55 lb.	18	43
70 lb.	19	44

Oat Variety Trials.

The season was favourable for the production of oats; ideal weather prevailed at harvest, and very little shedding occurred. Some excellent yields were obtained and early-maturing varieties were well to the fore. Mulga and Gidgee were outstanding, and gave high and consistent yields. Gidgee is a consistent yielder, and has straw of better quality and colour than Mulga. It is the most promising early variety since the introduction of that variety, which it bids fair to supplant. Because of its long stout awn, Budgery is of little value and will be omitted from further trials. Of the midseason varieties, Belar and Guyra gave satisfactory yields. Lachlan, grown under dry conditions, pinched badly, and did not compare favourably with Gidgee or Mulga.

At Kingsvale, the oat plots were sown in a 12-acre paddock, and a feeding-off test was carried out. The oats were fed off from 23rd July to 9th August, the paddock carrying 600 sheep for twelve days. Watch was kept to ascertain the palatability of the various varieties. The sheep showed first preference for Mulga, Buddah, and Belar. Algerian was next, and Lachlan and Guyra were left until last.

RESULTS of Oat Variety Trials.

Variety.	Tullibigeal.	Moombooldool.	Colinroobie.	Ardlethan.	Quandialla.	Junee.	Muttama.	Young.	Kingsvale.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Algerian ...	...	...	...	25 3	40 28	16 12	48 18	31 0	31 30
Belar ...	...	26 12	21 28	...	40 22	31 38	51 11	32 35	23 26
Buddah ...	17 37	28 16	...	22 17	...	44 37	...	31 10	22 27
Budgery ...	...	...	...	...	...	17 14	...	...	26 36
Gidgee ...	17 22	32 14	23 10	...	43 39	...	...	...	...
Guyra ...	...	...	...	...	36 18	32 28	48 22	40 15	27 4
Lachlan ...	11 12	...	14 0	24 12	38 38	24 33	46 10	32 20	31 31
Laggan ...	22 28	...	...	...	...	...	...	...	...
Myall ...	16 0	...	...	18 30	...	...	...	34 36	...
Mulga ...	19 36	31 27	23 7	26 11	44 12	47 29	59 24	30 0	26 6

Fertiliser Trials with Oats.

These trials show some very outstanding results. In every instance an application of 65 lb. superphosphate substantially increased the yield, the average increase for the three plots being 10 bus. 23 lb. M17 (two parts superphosphate and one part sulphate of ammonia) at 100 lb. per acre gave a small increase compared with 65 lb. superphosphate, but barely sufficient to cover the cost of the fertiliser, the average increase being 1 bus. 27 lb.

RESULTS of Fertiliser Trials with Oats.

	Ungarie.	Junee.	Kingsvale.
	bus. lb.	bus. lb.	bus. lb.
65 lb. superphosphate... ...	40 22	47 29	26 6
100 lb. M17	41 39	50 18	27 2
No manure	30 21	32 32	19 22

Mulga was the variety used.

Oats for Hay at Batlow.

At Batlow there is need for an early-maturing oat, which will withstand the rigorous winter conditions, and which can be sown in May or June, following on the potato crop. The following results are not strictly comparable owing to soil variation, Mulga and Gidgee having the biggest handicap:—

Variety.	Yield per acre. t.	c.	q.
Laggan	1	18	2
Buddah	1	8	1
Guyra	1	4	0
Mulga	0	12	0
Gidgee	0	8	3

Irrigation Area and Adjoining Country (Yanco End).

H. J. DARGIN, H.D.A., Agricultural Instructor.

The following farmers co-operated with the Department in conducting wheat and oat experiments on the Yanco end of the Murrumbidgee Irrigation Area during the season 1928:—

E. M. McKenzie, Brobenah, via Leeton.
T. C. Davies, Parkside, Brobenah.
J. H. Trethewey, Farm 30, Five Bough.
J. E. Williams, Farm 56, Five Bough.
J. F. O'Callaghan, Farm 52, Five Bough.
Maybon Bros., Farm 29, Five Bough.
E. G. Wightwood, Farm 992, Gogeldrie.
A. E. Bowmaker, Farm 1429, Gogeldrie.
W. Edwards, Farm 367, Leeton.
Houghton Bros., Farm 918, Leeton.
L. Snelson, Farm 383, Leeton.
W. Coughlan, Farm 196, Leeton.
E. J. Lovell, Farm 25, Leeton.
A. A. Amey, Farm 1093, Murrami.
B. E. Owers, Farm 1079, Murrami.
E. J. Wheeldon, Farm 1092, Murrami.
J. Sippel, Farm 138, Stoney Point.
A. Cartmel, Farm 8040, Wamoon.
E. Duruz, Farm 7, Yanco.

Owing to the adverse seasonal conditions experienced throughout the Murrumbidgee Irrigation Area the results obtained on the non-irrigable country were hardly up to the standard of previous years; oat trials failed on three properties, and no records were obtainable.

The Season.

Some very useful rains fell during the fallowing period—from the beginning of January until the end of April 895 points were registered—with the result that in all cases there was an excellent supply of moisture in the ground at time of sowing. Several farmers on the dry area found it necessary to give additional cultivations to prevent evaporation and to control the growth of weeds, which grew rapidly even though a number of sheep were grazed on the fallows.

A splendid germination resulted, and in most cases the stooling was all that could be desired; unfortunately, droughty conditions, even worse than those experienced in the preceding year, prevailed throughout the growing period of these cereals, with the result that crops which gave every indication of being something out of the ordinary during the early stages of their growth browned off rapidly, mainly through want of moisture during late August, September, and October, and yields of from 8 to 12 bushels per acre were harvested from them.

Fortunately for wheatgrowers the spring this season was much cooler than last, and only in a few cases was it found necessary to feed off crops which would not return seed or a little better.

On the irrigable country some splendid crops of both wheat and oats were harvested, although on the whole they were not as good as the crops harvested on this class of country last year. Water for irrigation purposes was not made available early enough in the season for the young growing plants, on account of necessary repairs being made to the main supply channels.

The rainfall during the fallowing and growing periods was as follows:—

On the fallow—May 1927, 141 points; June, 80; July, 121; August, 85; September, 88; October, 377; November, 26; December, 15; January, 1928, 179; February, 344; March, 275; total, 1,731 points.

On the crop—April, 1928, 97 points; May, 85; June, 51; July, 161; August, 36; September, 52; October, 116; November, 12; total, 610 points.

On the dry areas the rainfall during the effective period was considerably less than the 610 points registered at Leeton, round about 420 to 440 points being registered by rain gauges in those parts.

The Plots.

Brobenah (E. McKenzie).—Soil, red sandy loam; previously cropped with wheat on six occasions; mouldboard-ploughed 3 to 4 inches early June, springtoothed 27th July, harrowed 29th August, springtoothed early October, 26th January, and 7th April; sown with combine and drag harrowed on 8th May, seed 60 lb. per acre, superphosphate 70 lb. per acre.; the seed-bed was in excellent condition; harvested 27th November.

Brobenah (T. C. Davies).—Soil, red sandy loam; old cultivation land; mouldboard-ploughed 4 inches early June, springtoothed first week in October, springtoothed early January and again middle March; springtoothed and drilled 18th May; the seed-bed was in splendid condition; 60 lb. seed and 60 lb. superphosphate per acre were used.

Five Bough (J. H. Trethewey).—Soil, red to chocolate loam; previously cropped on four occasions, the last crop being oats in 1920; disc-ploughed 4 inches middle July, springtoothed early October, harrowed middle January, springtoothed middle February and late April; sown with combine on 2nd May, 60 lb. seed and 60 lb. superphosphate being used per acre; seed-bed was in splendid condition.

Five Bough (J. E. Williams).—Soil, sandy loam; mouldboard-ploughed 4 inches end July, springtoothed early October, Wimmera scarified early November, springtoothed second week in January and on 20th February, Wimmera scarified early April; sown with combine 7th May in a moist seed-bed at the rate of 60 lb. seed, with superphosphate at 60, 70, and 80 lb. per acre; harvested 21st November.

Five Bough (J. F. O'Callaghan).—Soil, red loam, irrigable, old cultivation land; mouldboard-ploughed 4 inches middle January, springtoothed immediately afterwards, springtoothed middle January and again on 10th

March, disced 17th April; sown with disc drill 18th April in a moist seed-bed, using 60 lb. seed and 60 lb. superphosphate per acre; irrigated once; cut for hay on 3rd November.

Five Bough (Farm 559).—Soil, red to grey loam; had grown three crops in the last five years; mouldboard-ploughed 4 inches early August, springtoothed early and late October, harrowed middle November, springtoothed early January, late January, and middle May; drilled and harrowed on 25th April in an excellent seed-bed at the rate of 70 lb. seed and 70 lb. superphosphate per acre; harvested 28th November. Yields of Federation and Bena were much reduced by flag smut.

Gogeldrie (Farm 992).—Soil, stiff red clay loam, previously cropped many times with summer fodders, and oats 1926; disc-ploughed 3 to 4 inches in January, 1927, again disc-ploughed September, 1927, springtoothed 25th January and 8th April; sown with disc drill on 12th April at rate of 60 lb. seed and 60 lb. superphosphate per acre. One watering was given on 10th September; harvested 10th November. The yield of Nabawa was reduced through the plot going down badly, while that of Exquisite was badly pinched through ripening too quickly. A second watering would have been given these plots had not Nabawa gone down.

Gogeldrie (Farm 1429).—Soil, sandy loam to clay loam, irrigable, previously grown many summer fodder crops; disc-ploughed 4 inches 9th arch, springtoothed 10th April and again 1st May; disc-drilled 3rd May with 40 lb. seed and 60 lb. superphosphate per acre in a moist seed-bed; harrowed 14th May; one watering given on 8th September; cut for hay on 8th November. Laggan was three weeks earlier than other varieties, and shed a little grain before remainder were ready to cut.

Leeton (Farm 367).—Soil, red clay loam, irrigable, old cultivation land; mouldboard-ploughed 4 inches end February, 1927, disced end June, springtoothed early October, disced late March, harrowed early April and again end of April; sown with combine 9th May in a moist seed-bed at rate of 60 lb. seed and 60 superphosphate; one watering was given on 18th September; harvested 11th December. Yield of Rajah was reduced through grain becoming pinched.

Leeton (Farm 383).—Soil, red to grey loam, irrigable, old cultivation land; mouldboard-ploughed 4 inches 24th February, graded 16th April, disc cultivated 8th March, again 1st April, springtoothed both ways prior to sowing on 20th April at the rate of 60 lb. seed and 60 lb. superphosphate per acre; harrowed same day; harvested 25th November. Two waterings were given—on 14th September and 14th October. Yields of Union and Federation were considerably reduced owing to a heavy band of clay which ran through these two plots.

Leeton (W. Coughlan).—Soil, sandy loam, virgin land, dry area; mouldboard-ploughed 4 inches end September, springtoothed and harrowed end February, springtoothed end April, combined early May, and sown with

combine 5th May at the rate of 60 lb. seed and 60 lb. superphosphate per acre in a moist seed-bed; harvested 16th December.

Leeton (Farm 25).—Soil, red loam, dry area; six crops had previously been grown on this land; disced 3 inches late July, springtoothed end September, disced early March, sown with the combine in a moist seed-bed 30th April at the rate of 60 lb. seed and 60 lb. superphosphate; harvested 19th December. The yield of Currawa was considerably reduced owing to the plants breaking off at the ground.

Murrami (Farm 1093).—Soil, red to grey clay loam, virgin land, irrigable; disc-ploughed 4 inches early February, springtoothed 26th March and again end April; sown with combine at the rate of 60 lb. seed and 60 lb. superphosphate in a moist seed-bed on the 23rd May; harvested 13th December. Two waterings were given—on 9th September and a fortnight later. Currawa, Exquisite, and Turvey failed owing to the land being insufficiently graded. Yields of Rajah, Wandilla, and Marshall's No. 3 were all reduced through water not being available early enough in the season.

Murrami (*Farm* 1079).—Soil, light red loam, irrigable, virgin land; disc-ploughed 4 inches early March, combined late March; drilled on 20th April at the rate of 70 lb. seed and 70 lb. superphosphate, and harrowed; harvested 27th November. Watered twice—on 7th September and 7th October. The yields of all varieties were reduced through the swelling of puff banks, which prevented the water from reaching the plants growing on them. The yield of Union and Exquisite was also reduced owing to the grain being pinched.

Murrami (Farm 1092).—Soil, red to grey clay loam, irrigable, old cultivation land; disc-ploughed 4 inches 4th February, harrowed 6th February, springtoothed 9th March, sundercut 21st April, drilled 14th May at the rate of 70 lb. seed and 70 lb. superphosphate per acre in a moist seed-bed: harvested 5th December. One irrigation was given—on 30th September. Yields of all varieties were reduced considerably owing to damage done by mice.

Leeton (Farm 918).—Soil, stiff red clay loam, irrigable, old cultivation land; disc-ploughed 4 inches middle December, springtoothed middle January, middle February, and early May; sown with combine 15th May in a moist seed-bed at the rate of 60 lb. seed and 70 lb. superphosphate per acre: harvested 25th November. One watering was given—on 7th October. The plots had gone off badly by this time, but all varieties made rapid growth after watering, though they never fully recovered, and reduced yields resulted.

Yanco (Farm 7)—Soil, sandy loam, dry area, two crops grown previously; disc-ploughed 3 inches end December, disced middle March, springtoothed end April; sown with combine in a moist seed-bed at the rate of 60 lb. seed and 60 lb. superphosphate; harvested 4th December. Many of the heads of all the varieties (oats) ripened early and shed before the remainder of the crop was ready to strip.

Yields of Wheat Variety Trials.

Variety.	Leeton.							Brobenah.		Murrami.			Gogeldrie.
	Farm 196.	Farm 26.	Farm 383.	Farm 918.	Farm 367.	Farm 40.	Farm 559.	T. C. Davies	E. McKenzie.	Farm 1092.	Farm 1079.	Farm 1093.	Farm 992.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Bobin	...	...	...	...	...	17 48	...	...	19 45	...	...	...	...
Bena	...	10 22	39 56	24 20	18 40	14 23	11 36	...	20 10	...	16 45	...	...
Clarendon ...	...	...	...	...	...	...	...	17 10	...	...	...	...	...
Canberra ...	...	...	...	...	...	18 24	...	20 37	...	13 46	...	...	...
Currawa	10 19	12 10	30 48	...	...	...	...	...	...	...	...	...	...
Duri	...	...	...	...	...	...	...	22 25	...	14 10	...	...	...
Exquisite ...	...	14 36	...	...	24 15	...	...	...	...	...	19 12	...	15 20
Federation ...	...	8 12	29 40	...	...	...	10 22	18 47	...	...	20 7	...	...
Gluyas Early ...	...	...	...	...	...	13 34	...	18 46	...	...	...	...	...
Marshall's No. 3...	...	...	37 20	...	...	...	...	...	...	...	20 16	18 7	...
Nizam	8 32	...	...	...	...	16 22	...	...	...	...	...	...	...
Major	...	...	...	21 14	...	...	...	...	...	...	...	...	...
Nabawa	...	...	...	...	...	...	...	19 15	22 3	17 7	...	...	12 36
Onas	...	...	...	...	...	...	14 7	...	...	...	...	...	13 22
Penny	13 5	13 8	...	17 26	...	...	...	...	...	...	...	...	17 11
Rajah	...	...	...	24 28	27 10	...	...	...	...	...	16 15	19 27	...
Riverina	...	...	...	...	...	...	...	...	20 10	8 45	...	...	...
Ranee	...	...	...	...	...	...	...	...	17 21	17 21	...	...	...
Turvey	...	...	...	...	26 12	...	...	...	...	...	...	...	13 8
Union	...	8 40	26 42	18 8	...	...	11 38	15 11	16 55	...	22 8	...	...
Waratah ...	...	...	...	...	...	13 39	...	19 11	22 10	14 36	...	...	...
Wandilla ...	7 4	11 6	...	24 7	21 4	...	...	...	...	...	...	17 28	19 8
Yandilla King ...	7 21	...	28 22	21 11	37 20	...	14 13	...	...	...	...	...	16 8

Comments on Wheat Varieties.

Critical comment on varieties is scarcely justified, because of the adverse seasonal conditions. Federation, which generally does so well on the dry areas, even during dry seasons, did not do well on any of the plots in these localities, but nevertheless payable yields of this variety were harvested from large areas throughout the irrigation area. Yandilla King, Duri, Bobin, Canberra, Waratah, and Exquisite all showed up to advantage on the non-irrigable plots.

On the irrigable plots, Yandilla King, Bena, Rajah, and Marshall's No. 3 were the outstanding varieties, while some good crops of Major, Penny, Union, Wandilla, and Nabawa were also harvested.

Yandilla King is becoming an even greater favourite for sowing on the heavy clay loams under irrigation than in the past, and large quantities of seed of this variety have been procured for sowing in 1929.

Turvey, Onas, and Riverina again gave disappointing results on both irrigable and non-irrigable land under the adverse conditions experienced during the season.

A most noticeable feature at harvest was the manner in which the grain of all varieties had filled up into full plump samples, even though the crops were otherwise weak. This was no doubt due to the cool weather experienced during the late spring months.

Rate of Fertiliser Trial.

A rate of fertiliser experiment was carried out at Farm 56, Five Bough (J. E. Williams), two varieties of wheat being used, namely, Yandilla King and Marshall's No. 3. Sixty pounds of seed were used on each plot, and

superphosphate was applied at the rate of 60 lb., 70 lb., and 80 lb. per acre. The soil was a light red loam to sandy loam; there are several thousand acres of this class of wheat land in this vicinity.

The results were as follows:—

	Yield per acre.			
	Yandilla King.		Marshall's No. 3.	
	bus.	lb.	bus.	lb.
Superphosphate at—				
60 lb. per acre	16	14	14	8
70 ,, ...	17	52	15	30
80 ,, ...	17	13	15	36

The fallow had been well worked, and was in splendid condition at the time of sowing. All plots germinated exceptionally well and the stooling was good. The six plots appeared to make an even growth until late in August, when the drought conditions commenced to affect all the crops in this locality to a marked extent.

From this time on a slight difference in favour of the 70 lb. and 80 lb. per acre applications could be noticed. A plump sample of grain was harvested from all plots.

Oat Grain Variety Trial.

Oat grain variety trials were carried out on six farms. Two of these failed owing to drought, and no records were obtainable. The yields of those harvested were as follows:—

YIELDS of Oat Grain Variety Trials.

Varieties.	Yanco. Farm 7.		Leeton. Farm 383.		Murrami. Farm 1093.		Five Bough. Farm 30.		Gogeldrie. Farm 992.	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Algerian	5	35	40	25	...	...	...	...	21	18
Buddah	...	...	...	...	8	29	...	...	...	...
Gidgee	8	13	...	...	8	12	23	25	...	...
Guyra	...	...	21	22	...	...	14	5	...	...
Laggan	16	15	...	...	7	20	16	4	...	...
Lachlan	...	...	32	26	...	...	...	...	...	...
Mulga	15	10	...	...	27	33	16	18	24	7
Myall	16	37	...	...	...	...	19	20	...	...

Farm 7. (E. Duruz).—The soil was a sandy loam. The plots were sown on the 23rd May, 60 lb. seed and 80 lb. superphosphate being used.

Farm 383 (L. Snelson).—Soil, red to grey clay loam, irrigable land; sown 30th April, seed 60 lb. and superphosphate 60 lb. per acre. Watered twice—1st September and 1st October; stripped 18th November.

Farm 1093 (A. A. Amey).—Soil, red to grey clay loam, irrigable land; sown 7th May, 60 lb. seed and 70 lb. superphosphate per acre. One watering only was given—on 9th September; harvested 28th November. There was much second growth with Buddah, Gidgee, and Laggan, but practically none with Mulga, which stripped 27 bushels 33 lb. per acre. Laggan, Gidgee, and Buddah all shelled badly while waiting for the second growth to ripen.

Farm 30 (J. H. Trethewey).—Soil, red to chocolate loam, non-irrigable land; sown on 7th April with exception of Guyra, which was sown later, 60 lb. seed and 60 lb. superphosphate per acre being used. Stripped 29th October. Mulga and Laggan shelled out badly while waiting for the other varieties to ripen.

Farm 992 (E. G. Wightwood).—Soil, stiff red clay loam, irrigable land; sown 16th April with 60 lb. seed and 60 lb. superphosphate per acre. One watering was given—on 14th September. Grain was lost owing to shedding. Both varieties, which were harvested on the 18th November, were slightly affected with rust.

Oaten Hay Variety Trials.

Oaten hay variety trials were carried out on three farms. One of these failed owing to the droughty conditions, and no record was obtainable. The following results were obtained at Gogeldrie and Five Bough:—

YIELD per Acre.

Variety.	Gogeldrie. Farm 1429.				Five Bough. Farm 52.			
	tons.	cwt.	qr.	lb.	tons.	cwt.	qr.	lb.
Lachlan	1	12	3	5	2	0	1	6
Laggan	1	10	0	2	1	15	1	8
Myall	1	5	1	1	....			
Gidgee	1	9	3	15	....			
Buddah	1	4	2	18	....			
Mulga	1	10	2	21	1	4	0	10
Belar	....				2	0	0	20

Farm 1429 (A. E. Bowmaker).—Sandy loam to red clay loam, irrigable land; sown 3rd May, 40 lb. seed and 60 lb. superphosphate per acre. Harvested 8th November. One watering only was given—on 8th September. All varieties were slightly affected with rust. A small quantity of grain was lost from Laggan.

Farm 52 (J. F. O'Callaghan).—Soil, red loam, irrigable land. The seedbed was in excellent condition; sown 18th April, 60 lb. seed and 60 lb. superphosphate per acre being used; harvested 3rd November.

Central Western District.

W. D. KERLE, H.D.A., Senior Agricultural Instructor.

FIELD experiments were conducted in co-operation with thirty six wheat-growers in centres representative of the central western district. The approximate total area devoted to these trials was 468 acres, of which an area of 300 acres was devoted to variety trials with wheat, 110 acres to similar trials with oats, 43 acres to manurial and seeding trials with wheat and 15 acres to winter fodders. The results obtained were very satisfactory and provide invaluable data for local farmers. With three exceptions, all the wheat-farmers who co-operated with the Department in these experiments were members of local branches of the Agricultural Bureau, which ensures the utmost benefit being derived from the trials.

The experiments were conducted with the following farmers:—

Wheat Variety Trials—

Wm. Burns, "Goongirwarrie," Carcoar.
G. E. Bradley and Son, Pinecliffe, via Molong.
W. J. Bradford, "Pine Park," Eulimore, via Eugowra.
R. B. Black, "Braemar," Greenethorpe.
C. A. Carter, "Kikiamah," Grenfell.
F. L. Corke, Wynnefield, via Cowra.
Davis Bros., "Ingledell," Avenal, via Cargo.
Loomes Bros., Cranbury, via Toogong.
Maroney Bros., "Miramichi," Tyagong, via Grenfell.
A. J. McKay, "Maxville," Greenethorpe.
F. Mulligan, "Woodlands," Trajere, via Eugowra.
S. E. Nash, "Wollombeen," Lockwood, via Canowindra.
Allen Nash, "Windarah," Toogong.
H. Nealon, "Currajong," Quandong, via Grenfell.
D. O'Neill, "Clear View," Bowan Park, via Cudal.
L. R. and J. R. Parker, "Laurel Park," Bogalong, via Grenfell.
Chas. Pengelly, Forbes-road, Eugowra.
Powderley Bros., "Cambrai," Tyagong, via Grenfell.
J. W. Rains, "Mayfield," Birriwa
Robinson Bros., Tallawang, via Gulgong.
H. H. Taylor, "Ravensleigh," Eualdrie, via Grenfell.

Oat Variety Trials—

O. G. Blayney, "Baroola," Grenfell.
A. N. Freebairn, "Kingswood," Greenethorpe.
W. F. Griffin, "Valicare," Mogongong, via Grenfell.
Joyce Bros., "Greendale," Tyagong, via Grenfell.
T. Howell, "Federal View," Eugowra.
Maroney Bros., "Miramichi," Tyagong, via Grenfell.
H. H. McDonald, "Belmont," Lockwood, via Canowindra.
F. Mulligan, "Woodlands," Eugowra.
H. Nealon, "Currajong," Quandong, via Grenfell.
D. O'Neill, "Clear View," Bowan Park, via Cudal.
L. R. and J. R. Parker, "Laurel Park," Bogalong, via Grenfell.
H. C. Toole, "Helston," Tarana.

Manurial Experiments—

F. Adams, "Renown," Greenethorpe.
Barr Bros., "Kelvin Grove," Tyagong.
O. G. Blayney, "Baroola," Grenfell.
G. Davidson, "Gambara," Greenethorpe.
F. Freudenstein, junior, "Chippindale," Tyagong.
H. V. Gray, "Martindale," Greenethorpe.
T. Howell, "Federal View," Eugowra.
J. T. Hawick, Quandong, via Grenfell.
N. G. McMillan, "Marara," Eugowra.
G. L. McLaren, "Locksley," Nora Creek, via Cumnock.
S. E. Nash, "Wollombeen," Lockwood, via Canowindra.
Robinson Bros., Tallawang, via Gulgong.
C. Pengelly, Forbes-road, Eugowra.

Seeding Trials—

O. G. Blayney, "Baroola," Grenfell.
J. T. Hawick, Quandong, via Grenfell

The Season.

The chief features of the season were heavy summer rains, which badly washed fallows and caused heavy growth of *Eragrostis major* (Stink grass), ideal sowing conditions followed by perfect winter weather, a dry spring, and early summer with occasional strong hot winds, and, in the more favoured portion of the district as regards rainfall, serious depletion of yields due to stem rust.

The initial ploughing of the fallows in 1927 was in many cases delayed owing to the dry conditions which prevailed up to the end of September. Fallowing was general in October, and a late harvest permitted a working or two in November or December. January rains were heavy, but February falls ranged from 3 to 7½ inches and did a considerable amount of harm to fallows in undulating country.

The chief trouble caused by the summer rains was the heavy growth of Stink grass (commonly called Black grass), which it was impossible to control. It was difficult to bring the fallow back into condition, but March and April weather was excellent, and allowed the fallow to be put into excellent condition for sowing. The germination was faultless this season, as the grain was sown under the best possible conditions, and favourable winter weather caused crops to grow well. Frosts were not severe during the winter, although damage was done at two centres from this cause. Dry conditions set in in August and persisted right through harvest with hot weather and occasional strong winds. Enough rain fell to assist the crops to finish, although some "haying off" was general, and in many cases the grain was pinched. Harvesting took place exceptionally early, and without rain being recorded, consequently the grain was of excellent colour and good weight.

The dry conditions in spring proved a blessing in disguise, as in the portion of the district where rain fell at that time stem rust developed and caused a serious reduction in yield. While traces of stem rust were notice-

able generally throughout the district, the localities which suffered most were Cowra, Greenethorpe, and Canowindra. Generally speaking, the season was one where good fallowing methods told, the crop having a reserve of moisture to draw on when "finishing" rains did not fall. Paddocks which were heavily coated with Stink grass in the summer also showed to disadvantage at this stage, further demonstrating the necessity of preventing its growth by all possible means.

Rainfall Records.

The following table shows rainfall registered at representative centres. Rain fell generally on 4th November, but none from then until after harvest. As what fell on 4th November was of benefit to the crops, it is included in the table.

	Grenfell.	Greenethorpe.	Cowra.	Tallawang and Birriwa.	Cranbury and Lockwood.	Tyagong.	Canowindra.	Eugowra.	Pinecliffe.
				Rainfall for the Fallowing Period.					
1927.									
July ...	130	116	44	76	62	127	85	47	309
August ...	59	101	132	61	94	75	100	24	40
September	227	234	232	129	179	104	228	261	37
October ...	137	123	269	91	242	211	191	111	125
November...	305	338	234	574	345	279	250	218	125
December	20	119	19	175	130	100	33	6	0
1928.									
January ...	389	200	207	336	257	314	229	238	184
February ...	568	684	300	741	500	549	354	286	583
March ...	370	295	444	259	273	318	302	272	243
Total on fallow...	2,205	2,210	1,881	2,442	2,082	2,077	1,772	1,463	1,646
1928.				*Rainfall for Effective Growing Period.*					
April ...	280	460	208	156	163	444	162	132	189
May ...	112	112	62	40	86	109	93	55	61
June ...	115	146	155	125	176	147	186	152	126
July ...	243	284	268	183	238	252	267	248	230
August ...	99	80	75	0	68	88	79	67	35
September	92	96	39	24	36	62	66	59	27
October ...	50	172	137	113	141	114	202	169	152
Nov. (to 4th)	46	74	103	92	84	75	89	66	78
Total on Crop ...	1,037	1,424	1,047	733	992	1,291	1,144	978	898

Cultural Details of Wheat Variety Trials.

Carcoar (W. Burns).—Gray loam soil, granitic, old cultivation paddock previously cropped with oats, potatoes and wheat; last crop oats. Mouldboard ploughed (4 inches) in November; springtoothed February, March and April, and combine sown with 75 lb. seed and 60 lb. superphosphate; harvested 30th November. Rust present, lightest on Cleveland.

Pinecliffe (G. E. Bradley and Son).—Light red loam, originally white box country, old cultivation paddock, last crop oats. Mouldboard ploughed May, disced November, combined early February and again in March, and combine sown using 60 lb. seed and 69 lb. superphosphate. Excellent seed bed and germination. Two sowings made, that of late varieties on 20th April and early varieties on 18th May with Bena as check. The season suited the early sown varieties, Bena being 5 bushels 24 lb. heavier in the April sowing.

Eulimore (W. J. Bradford).—Second crop on new ground, pine and box country, previous crop wheat, light red loam soil. Sown on fallow on 16th and 17th May with 1 bushel seed and 68 lb. superphosphate. Disc ploughed August; springtoothed November; combined January, February, March and April; harrowed February and April; combine sown and harrowed. Dry weather caused most varieties to burn off, Nizam being particularly bad.

Greenethorpe (R. B. Black).—Light red loam, undulating white box country, old cultivation paddock, previous crop wheat. Fallow disced June and again in August; combined November; scarified January; combined end February; scarified and harrowed May; combine sown and harrowed. Sown 21st May with 63 lb. seed and 95 lb. superphosphate. Rust bad in Duchess, Ghurka and Bobin. Waratah attacked lightest and yielded well.

Grenfell (C. A. Carter).—Medium, red loam over clay 6 inches deep, originally white and yellow box, old cultivation paddock, previous crop wheat. Fallow mouldboard ploughed August; harrowed September; springtoothed twice in December; harrowed January; springtoothed February and March, and harrowed April. Sown with hoe drill on 7th and 8th May, with 60 lb. seed and 70 lb. superphosphate. Grain in Exquisite, Bena and Rajah pinched owing to absence of "finishing" rains.

Wynnefield (F. L. Corke).—Medium light red loam, cleared approximately twenty-eight years, grazing eighteen years and cropped since; previous crop wheat. Mouldboard ploughed September; harrowed October; disced January; harrowed February; disced and harrowed April; harrowed early May; springtoothed prior to sowing with hoe drill on 18th May. Sixty pounds seed and superphosphate used. Rust medium bad on some varieties, particularly Union, Duchess and Bena.

Avenal (Davis Bros.).—Cleared forty-five years, originally white box country, previous crop wheat. Fallow disc ploughed June; sown August, 1927, and fed off September; springtoothed and disced October and again in January; harrowed February; combined end March and third week April; harrowed prior to combine sowing on 2nd and 3rd May, seed and superphosphate each 65 lb. being used. Sowing conditions were excellent; even plots, but not dense; rust present, but only Union badly attacked.

Cranbury (Loomes Bros.).—Light red loam under crop sixteen years, previous crop wheat, box country originally. Disc ploughed October; disced January; combined March; harrowed twice end April; combine sown and harrowed. Sown 9th and 10th May, using 60 lb. each seed and superphosphate; germination excellent and growth fair; burnt off in dry weather, Wandilla affected most.

Tyagong (Maroney Bros.).—Medium red loam, clay 6 inches, originally white box, cleared some years, used for grazing chiefly, not cropped regularly, previous crop wheat. Fallow mouldboard ploughed August; combined end November; disced February; scarified May; drill sown and harrowed. Sown 10th May with 60 lb. seed and 70 lb. superphosphate, germination and growth being excellent; dense even plots and little rust; grain pinched on Exquisite; Duchess excellent plot.

Greenethorpe (A. J. McKay).— Black-red loam, under crop twenty years, originally white box country. Disced July, 4 inches; harrowed August; combined November and January; springtoothed February; combined April; springtooth in front combine; harrowed week after sowing. Sown 22nd May, with 60 lb. seed and 90 lb. superphosphate. Yields reduced by stem rust which was very bad on Bobin and Canberra, medium bad on Boonoo and little on other varieties. Ford, Nabawa and Waratah excellent plots. Bobin grain very light and pinched owing to rust.

Trajere (F. Mulligan).—Medium red loam, originally white and yellow box. Disc ploughed August, combined end November and beginning January, harrowed January, springtoothed March and 1st April, and combine sown on 2nd and 4th May, using 60 lb. seed and 70 lb. superphosphate. Watchman very early variety, sown too early and caught hot winds which ripened prematurely. Stem rust pinched grain of Exquisite slightly and of Bobin and Rajah.

Lockwood (S. E. Nash).—Medium red loam soil originally white and yellow box, old cultivation paddock. Disced March, sown with oats in April and fed off, mouldboard ploughed October, springtoothed January, February and twice April, combine sown and harrowed. Sown 1st May, 60 lb. seed and 80 lb. superphosphate; 6.35 inches of rain fell on oat crop and 17.47 inches on fallow and 9.92 on the wheat crop. Rust present which slightly pinched the grain of Yandilla King and with the dry finishing weather pinched grain badly of Exquisite.

Toogong (A. Nash).—Light red loam, nine years under crop, originally box country, previous crop wheat. Mouldboard ploughed October, combined January, harrowed February, combined April and May and sown with hoe drill. Sown 21st May with 60 lb. seed and 70 lb. superphosphate. Fallow washed badly February.

Quandong (H. Nealon).—Light red to grey loam soil, originally white and yellow box, old cultivation paddock, grazing 1927. Mouldboard ploughed early January; harrowed January; springtoothed February and April and harrowed; springtoothed May and harrowed; late sown varieties springtoothed June; sown with hoe drill and harrowed. Two sowings of early and late varieties; latter sown 18th May, and former 11th June, with 65 lb. and 60 lb. seed and 70 lb. and 90 lb. superphosphate, respectively. Bena used as check and was 6 bushels better in yield in the early sowing.

Bowan Park (D. O'Neil).—Strong red loam, white box country, cleared nine years. Mouldboard ploughed September; harrowed and springtoothed

twice; disc cultivated mid-April; harrowed end April; combine sown 21st May, using 60 lb. each seed and superphosphate.

Bogalong (L. R. and J. R. Parker).—Light red loam soil, originally pine and box, previous crop wheat, very old cultivation paddock. Mouldboard ploughed September; harrowed September; combined January and twice in April; harrowed end April; combined May; and combine sown and harhowed. Sown 23rd and 24th May, using 60 lb. seed and 78 lb. superphosphate. Stem rust reduced yields, particularly in the case of Nizam, Union and Bobin.

Eugowra (C. Pengelly).—Cleared four years and cropped twice previous to present crop, deep red loam soil, originally pine and box, grazing 1927. Disc ploughed February, combined April and May, and combine sown and harrowed. Sown 19th May, 60 lb. seed and 70 lb. superphosphate being used.

Tyagong (Powderley Bros.).—Medium red loam, originally white box, old cultivation paddock, previous crop wheat. Fallow scarified July and again in October, when also harrowed; scarified November, January, March and 7th April; combine sown; fed off June. Sown May 9th, 60 lb. seed and 70 lb. superphosphate being used. Dry conditions and rust lowered yields, particularly of Union and Rajah.

Birriwa (J. W. Rains).—Light red loam, originally box country, cropped eighteen to twenty years, wheat 1927, failed and fed off. Disc ploughed December; disced January; harrowed three times February; disced twice early March; harrowed May; drill sown with 58 lb. seed and 80 lb. superphosphate.

Tallawang (Robinson Bros.).—Light red loam soil, cleared fifty years, cropped ever since, last ten years been under definite rotation of (1) winter fodders and (2) wheat. Disc ploughed September; springtoothed December, 14th and 27th January, February, March and mid-May; sown on 14th to 16th May with hoe drill, using 60 lb. seed and 80 lb. superphosphate. Only 2.29 inches rain fell in last three months of growth.

Eualdrie (H. H. Taylor).—Light sandy loam, old cultivation ground, white and yellow box country, last crop wheat. Disced beginning March, again May; harrowed twice, and drill sown. Sown 22nd May, using 70 lb. seed and 90 lb. superphosphate. Fed off late. Growth very poor, spring rains very light here, and strong winds in September thinned crop which later burnt off badly. Comparative yields not possible and crop fed off.

Hay Wheat Variety Trial.

A variety trial with hay wheats was carried out in co-operation with Mr. W. Burns, Carcoar, the yields being as follows:—

	t.	c.	q.	lb.
Cadia	4	0	1	6
Cleveland	3	14	0	3
Turvey	3	9	2	16
Marshall's No. 3	3	2	1	12
Zealand	2	19	2	22
Canimbla	2	17	3	13

Yields of Grain—Wheat Variety Trials, 1928.*

—	Pinecliffe (G. E. Bradley).	Eulimore (W. J. Bradford).	Greenethorpe (R. B. Black).	Grenfell (C. A. Carter).	Cowra (F. L. Oarke).	Avenal (Davis Bros.).	Cranbury (Loomes Bros.).	Tyagong (Maroney Bros.).	Greenethorpe (A. J. McKay).	Eugowra (F. Mulligan).	Lockwood (S. E. Nash).	Toogong (Allen Nash).	Quondong (H. Heaton).	Bowan Park (D. O'Neill).	Bogalong (L. R. and J. B. Parker).	Eugowra (Chas. Pengelly).	Tyagong (Powderley Bros.).	Birriwa (J. W. Rains).	Tallawang (Robinson Bros.).
Rainfall on fallow ...	inches. 16·46	inches. 14·16	inches. 22·10	inches. 20·35	inches. 17·05	inches. 18·24	inches. 20·20	inches. 19·38	inches. 23·23	inches. 14·16	inches. 17·47	inches. 20·20	inches. 11·09	inches. 15·87	inches. 16·89	inches. 5·58	inches. 20·77	inches. 15·11	inches. 23·05
Rainfall on crop.* ...	8·98	10·48	14·24	10·37	10·47	10·57	10·90	11·66	11·86	9·78	9·92	10·90	10·36	11·44	10·36	9·78	12·91	7·34	7·34
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Waratah ...	22 12	31 45	32 45	...	22 52	...	...	...	26 46	...	...	21 20	22 26	27 26	22 16	20 17	...	17 53	25 17
Nabawa ...	22 26	...	31 30	23 45	23 51	...	...	...	27 0	...	...	21 24	29 14	28 55	21 40	21 12	...	...	24 38
Duri ...	22 15	29 10	...	...	24 8	...	...	...	24 54	...	...	22 19	23 4	24 11	22 9	...	...	...	...
Cadia ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	23 22	...	...
Bena	21 41 27 25	...	...	23 39	20 44	27 36	20 41	31 14	...	22 40	...	...	25 5 19 44	21 40	...	...	24 51	19 8	21 26
Riverina ...	20 39	29 7	...	...	...	...	...	...	...	...	...	20 13	...	...	21 31	...	...	...	...
Turvey ...	27 47	...	...	...	...	29 14	20 0	31 24	...	18 38	...	...	25 59	20 20	...	...	...	17 29	...
Union ...	26 7	22 28	...	...	18 12	22 54	...	...	...	...	...	...	...	22 30	16 23	...	17 29	...	...
Penny ...	27 50	...	...	19 3	...	...	20 7	...	...	...	...	...	23 56	...	...	...	...	19 12	...
Wandilla ...	26 56	...	...	...	...	24 9	17 47	...	...	...	...	...	...	21 82	...	...	21 36	17 56	...
Nizam ...	...	16 0	...	...	...	...	...	...	...	...	...	16 40	...	...	14 55	...	...	...	...
Ranee ...	...	...	31 40	...	...	...	...	...	...	...	...	16 1	...	...	...	20 16	...	...	23 37
Bobin ...	...	...	28 10	...	...	...	...	...	18 50	27 12	...	...	...	...	21 37	20 4	...	...	...
Yandilla King ...	...	...	...	...	...	...	19 52	34 20	...	21 0	30 39	...	...	...	...	...	26 55	...	...
Bald Lady	...	...	20 9	...	...	...	...	...	...	...	...	...	17 84	...	...	18 46	...	...	...
Duchess ...	...	...	13 0	22 25	17 34	28 43	...	36 28	...	20 9	33 55	...	24 47	...	...	...	20 20	...	19 4
Marshall's No. 3 ...	...	...	...	23 24	...	30 43	...	33 36	...	...	...	...	...	...	...	...	24 43	...	...
Exquisite	...	...	...	21 7	...	...	19 11	22 30	...	20 53	28 58	...	25 80	...	...	...	...	...	...
Canimbla	...	...	...	21 27	...	...	...	26 32	...	19 33	34 50	...	...	...	...	...	...	...	...
Rajah ...	...	...	...	21 17	...	29 7	...	...	...	20 84	...	...	20 5	...	...	...	19 54	...	...
Boonoo ...	...	21 50	...	...	...	...	...	...	22 23	...	...	...	19 23	...	...	...	...	...	...
Ghurka ...	...	21 29	13 24	...	...	...	...	...	...	...	...	...	...	...	...	19 27	...	...	...
Early Bird..	...	20 3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Barootta Wonder	...	...	...		22 35	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gallipoli ...	...	...	...		...	...	20 44	...	...	...	...	...	...	...	...	18 19	...	...	22 2
Major ...	...	...	...		...	...	19 23	...	...	...	...	...	...	...	...	...	...	...	...
Ford ...	...	...	...	...	...	...	...	...	28 0	23 19	...	...	...	...	...	...	...	...	...
Canberra ...	...	...	...	...	...	...	...	...	21 34	...	...	22 50	...	26 39	...	...	...	...	23 55
Watchman	...	...	...	...	...	...	...	...	...	11 28	...	...	...	...	...	...	...	...	...
Federation	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	18 8	...

* Rainfall for effective growing period (April to November).

Oat Variety Trial.

The yields obtained in these trials are given in accompanying table.

The cultural methods adopted were:—

Grenfell (O. G. Blayney).—Medium red loam, cleared twenty years, second crop after grazing eight years, last crop wheat. Mouldboard ploughed May; springtoothed September and end October, also January, mid-February, and April; combine sown. Sown 28th May, with 58 lb. seed and 80 lb. superphosphate. Gidgee was badly attacked by rust, light on other varieties.

Greenethorpe (A. N. Freebairn).—Light red sandy loam, under crop for twenty-three or twenty-four years, white box country, last crop wheat. Mouldboard ploughed August; springtoothed November; scarified early January; harrowed end January; disced February; springtoothed April, and prior to hoe drill sowing on 30th May; 45 lb. seed and 80 lb. superphosphate were used.

Mogongong (W. F. Griffin).—Grey loam, clay at depth of 1 foot, previous crop wheat, under cultivation many years, originally white box country. Disc cultivated first week September; springtoothed early November and late November; disced March and harrowed; disced early April: springtoothed end April and early May; combine sown and harrowed week later. Seed 50 lb., and superphosphate 80 lb., used. Gidgee and Mulga damaged by wind and rainstorm. Rust present, being worst on Gidgee.

Tyagong (Joyce Bros.).—Sandy loam soil, cleared thirty years, white box country, previous crop wheat. Fallow disc cultivated (4½ inches) early October; scarified January and harrowed; scarified mid-February; scarified and harrowed early May and again mid-May, and sown with hoe drill. Sown 22nd May, using 58 lb. seed and 72 lb. superphosphate. Rust present, Gidgee and Lachlan being badly affected; Gidgee lodged and broke down due chiefly to rust.

Eugowra (T. Howell).—Light sandy loam, originally white and yellow box, under cultivation twenty years, sown 1927 and fed off. Disc ploughed February; combined April and May; combine sown and harrowed. Sown 17th and 18th May, using 1 bushel seed and 52 lb. superphosphate. Germination was satisfactory and growth very poor owing to heavy growth of Stink grass during summer and dry spring weather.

Tyagong (Maroney Bros.).—Medium red loam, cleared twenty years, cropped and grazed since, previous crop wheat 1917-18, grazed since. Mouldboard ploughed February; scarified April; combined May; sown with hoe drill on 3rd May, using 60 lb. seed and superphosphate. Cut with binder and threshed.

Lockwood (A. H. McDonald).—Medium red loam, cleared 1900, grey box country, previous crop wheat, sown 1927 and fed off. Disced 3rd February; harrowed 24th February; springtoothed March and April; harrowed April and May; sown with hoe drill. Sow 16th May with 50 lb. seed and 90 lb. superphosphate.

YIELDS of Oat Variety Trials, 1928.

	Grenfell (O. G. Blayney).	Greenethorpe (N. Freebairn).	Mogongong (W. Griffin).	Tyagong. (Joyce Bros.).	Eugowra (T. Howell).	Tyagong (Maroney Bros.).	Lockwood (H. H. McDonald).	Eugowra (F. Mulligan).	Quandong (H. Nealon).	Bowan Park (D. O'Neill).	Bogalong (L. R. & J. R. Parker).	Average for District.	Hay Yields. — H. C. Toole, Tafana.
	inches	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
Rainfall on fallow ...	22·20	21·62	19·20	17·79	5·58	9·32	6·80	14·16	11·09	15·87	16·89	......	5·08
Rainfall for effective growing period (April to Nov.) ...	10·37	13·73	10·66	9·70	9·78	11·66	10·15	9·78	10·36	11·44	10·36	......	9·16
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	t. c. qr.
Mulga	33 10	30 16	51 14	44 30	13 20	52 14	26 24	33 32	55 34	35 1	26 10	36 27	1 8 3
Buddah	34 0	30 22	37 4	45 35	......	......	25 8	34 29	49 26	34 33	......	36 19	1 1 0
Gidgee	33 38	25 22	47 12	34 30	......	51 16	32 0	......	......	37 5	11 0	34 5	......
Palestine	30 24	......	52 28	......	......	......	......	......	......	......	......	......	......
Fulghum	38 0	......	35 21	......	......	......	......	42 1	......	......	......	......	......
Lachlan	......	30 14	......	31 20	12 30	......	20 34	......	......	......	......	......	1 6 2
Laggan	......	31 27	......	......	......	......	......	31 10	......	......	......	......	......
Belar	......	......	48 3	41 0	12 28	42 18	25 32	......	47 7	......	24 36	34 24	......
Myall	......	......	......	......	11 32	......	......	......	......	......	......	......	......
Algerian	......	......	......	......	14 15	......	......	......	......	......	......	......	1 11 0
Budgery	......	......	......	......	......	......	25 16	......	......	......	......	......	......
Reid	......	......	......	......	......	......	......	......	29 32	......	......	......	......
Guyra	......	......	......	......	......	......	......	......	......	......	......	......	1 10 2

Trajere (F. Mulligan).—Same cultural details as wheat variety trial. Sown 4th May, using 55 lb. seed and 70 lb. superphosphate; harvested very early, 22nd October.

Quandong (H. Nealon).—Same cultural details as wheat variety trials. Sown 18th May, with 50 lb. seed and 70 lb. superphosphate. Reid oat much too late for district.

Bowan Park (D. O'Neill).—Same details as wheat variety trials. Seed 50 lb. and superphosphate 60 lb. sown on 21st May.

Bogalong (L. R. and J. R. Parker).—Sown alongside wheat variety trials with similar cultural details. Sown 23rd and 24th May, with 50 lb. seed and 78 lb. superphosphate. Attacked by rust which was very bad in Gidgee. Windstorm broke down the crop, and this, together with rust, reduced the yield by half.

Tarana (H. C. Toole).—Sandy loam of granite formation, under lucerne eighteen years. Mouldboard ploughed February; harrowed March; spring-toothed April and prior to sowing with hoe drill. Sown 17th May, with 50 lb. seed and 100 lb. superphosphate. Fed off August, which was too late for such a season, with the consequence that yields considerably reduced. Harvested for hay on 26th November.

Wheat Manurial Trials.

The results of the experiments to determine the most economical amount of superphosphate to apply to wheat are set out in tabular form on page 286.

Experiments were also undertaken at four centres to test the relative values of ephos phosphate and superphosphate. The following yields were obtained:—

Manure per Acre.	Greenthorpe (F. Adams).	Lockwood (S. Nash).	Eugowra (N. G. McMillan).	Nora Creek (G. L. McLaren).
Variety	Waratah.	Yandilla King.	Waratah.	Currawa.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.
110 lb. ephos phosphate ...	18 15	26 48	23 48	......
84 lb. superphosphate	24 15	30 39	28 27	......
79 lb. ephos phosphate ...	......	......	......	23 10
56 lb. superphosphate	......	......	......	25 40

Ephos is an imported phosphate selling at approximately £5 per ton, and the amounts of superphosphate and ephos phosphate used in the trials were worked out on the basis of equal cost.

Whereas ordinary rock phosphate from Nauru and Ocean Island contains 83 to 86 per cent. tricalcic phosphate, ephos contains the equivalent of 50 per cent. tricalcic phosphate, and, in addition, 20 per cent. calcium carbonate.

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The results were very much in favour of superphosphate, the ephos-treated plot in all cases being very poor, the growing crop being more like an unmanured plot in appearance from the commencement to the finish of growth.

The cultural details of the various manurial trials are as follows:—

Greenethorpe (F. Adams).—Union was sown in a quantity-of-superphosphate trial, and Waratah in an ephos *versus* superphosphate trial. The soil was a medium red loam over clay, 6 inches deep, old cultivation paddock, originally white and yellow box, previous crop wheat. Fallow disced June; springtoothed August, October, January, February, March, and May; combine sown on 24th May, using 60 lb. seed. Stem rust bad on Union and yield very light.

Tyagong (Barr Bros.)—Quantity-of-superphosphate trial with Union; mouldboard ploughed July-August; springtoothed October; scarified five times between then and sowing; combine sown. Soil light red loam, cleared fourteen years, originally white and yellow box country, sown 26th May, on fallow, with 66 lb. seed. Sown too late for the variety this season, rust bad.

Grenfell (O. G. Blayney).—Two quantity-of-superphosphate trials with Nabawa and Waratah. The former was sown in triplicate on light red loam soil in paddock cleared for twenty years and fallowed and cropped since. The fallow was disc ploughed September, combined November, February, and April, and combine sown on 15th May with 62 lb. seed—each plot was one-third acre. The Waratah trial had same cultural details as the oat variety trials, and was sown on 26th May, with 65 lb. seed.

Greenthorpe (G. Davidson).—Medium red loam, old cultivation paddock, white and yellow box country, previous crop wheat. Fallow mouldboard ploughed July; springtoothed October; disced January; combined March, again April; combine sown with Union on 19th May, using 58 lb. seed.

Tyagong (F. Freudenstein).—Light red loam soil, originally white and yellow box, old cultivation ground. Sown with Canberra 20th May, using 70 lb. seed on fallow mouldboard ploughed October; springtoothed November; combined January, March, and May; combine sown.

Quandong (J. T. Hawick).—Light red loam, box country, paddock under crop many years. Fallow disc ploughed July; springtoothed twice November; harrowed December; springtoothed January, February and three times in May; sown with hoe drill on 19th May, using 60 lb. seed. Variety used was Wandilla.

Eugowra (T. Howell).—Same details as oat variety trial. Sown with Waratah on 18th May, with 60 lb. seed.

Greenethorpe (H. V. Gray).—Union wheat on medium red loam soil. Disced February, 1927; sown with oats in April and fed off; disc cultivated October; combined January, February, March, and April, and combine sown on 2nd June, with 65 lb. seed.

Yields of Superphosphate Trials, 1928.

—	Greenethorpe (F. Adams).	Tyagong (Barr Bros.).	Grenfell (O. G. Blayney).		Tyagong (F. Freudenstein).	Greenethorpe (H. V. Gray).	Quandong (J. T. Hawick).	Eugowra (N. G. McMillan)	Lockwood. (S. E. Nash).	Eugowra (T. Howell).	Eugowra (C. Pengelly).	Tallawang (Robinson Bros.).	Greenethorpe (G. Davidson).
Variety.	Union.	Union.	Waratah.	Nabawa.	Canberra.	Union.	Wandilla.	Waratah.	Yandilla King.	Waratah.	Waratah.	Canberra.	Union.
	inches.	inches.	inches.		inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
Rainfall on fallow ...	22·89	20·77	19·96		17·65	17·59	18·88	...	17·47	5·58	5·58	23·05	22·10
Rainfall for effective growing period (April to Nov.) ...	13·73	12·91	10·37		12·91	14·24	10·36	8·28	9·92	9·78	9·78	7·34	14·24
Superphosphate per acre—													
lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
56	12 36	...	...	...	...	...	...	...	...	...	...	23 2	...
60	...	...	...	...	...	11 3	23 30	26 11	...	11 35	19 39	...	...
65	...	...	...	...	16 53	...	...	...	...	...	...	...	...
70	...	...	...	...	...	...	...	...	...	...	...	...	...
74	...	...	21 37	...	...	...	...	...	...	...	...	...	...
75	15 46	10 45	...	20 4	...	...	...	...	...	...	...	...	...
80	...	...	21 37	...	...	11 43	20 16	28 27	30 39	12 43	20 22	23 55	...
84	...	...	...	19 40	18 54	...	...	...	...	...	...	...	...
90	...	...	21 7	...	...	...	...	...	...	...	...	...	15 26
95	18 20	12 42	...	...	...	...	...	...	...	...	...	...	...
100	...	...	...	20 42	...	12 17	22 42	...	30 8	12 39	21 19	...	...
110	...	13 7	...	...	...	...	...	...	...	...	...	...	...
120	...	...	...	...	...	...	...	...	...	...	...	...	16 32
125	...	...	...	...	18 16	...	...	...	...	...	...	...	...
130	...	...	...	...	...	...	...	...	...	...	23 27	...	...
150	...	...	...	...	...	...	...	...	...	...	[illegible]	...	17 27
160	...	...	...	...	...	12 40	...	...	...	...	...	...	...
170	...	...	...	...	...	13 18	...	...	...	...	...	...	...

Eugowra (N. G. McMillan).—Heavy loam, alluvial. Mouldboard ploughed April after wheat, 1927; combined April and early May; combine sown and harrowed. Sown 26th May, with 60 lb. seed. Ground had been under cultivation twenty years, originally white and yellow box. Waratah was variety used.

Nora Creek (G. L. McLaren).—A trial with superphosphate and ephos sown on light sandy loam with Currawa on 1st May, using 56 lb. seed. Paddock under cultivation ten years, originally pine and box, previous crop wheat. Ground mouldboard ploughed January; springtoothed end January; harrowed twice February; springtoothed and harrowed March; combine sown.

Lockwood (S. E. Nash).—Same cultural details as wheat variety trial; sown with Yandilla King on 1st May, with 60 lb. seed.

Eugowra (C. Pengelly).—Details of wheat variety trial same as for this experiment. Sown with Waratah on 19th May. The trial was on practically new ground, this being the third crop.

Tallawang (Robinson Bros.).—Sown in the same rotation experiment as wheat variety trial with Canberra. Sown 16th May, with 60 lb. seed.

Seeding Trials.

Seeding trials were conducted at two centres. The cultural details were as follows:—

Grenfell (O. G. Blayney).—Two trials were conducted, one with Nabawa, the details of which are the same as for the quantity-of-superphosphate trial, and the other with Waratah sown alongside the oat variety trials. Nabawa was sown on 15th May, and Waratah on 26th May.

Quandong (J. T. Hawick).—Sown with Bena on light red loam after oats on stubble ground. Disc harrowed February; springtoothed May; sown with hoe drill and harrowed. Sown 11th June with 80 lb. superphosphate.

RESULTS of Seeding Trials.

	Grenfell (O. G. Blayney).		Quandong (J. T. Hawick).
	Nabawa.	Waratah.	Bena.
	bus. lb.	bus. lb.	bus. lb.
62 lb. seed, 84 lb. superphosphate	19 40	......	......
68 ,, 84 ,, ...	22 19	......	......
62 ,, 100 ,, ...	20 42	......	......
75 ,, 100 ,, ...	22 4	......	......
65 ,, 90 ,, ...	......	21 7	......
73 ,, 90 ,, ...	......	20 34	......
60 ,, 80 ,, ...	......	......	14 45
80 ,, 80 ,, ...	......	......	13 9

General Observations.

Wheat Variety Trials.—The two adverse conditions which predominated this season and which materially affected the behaviour of wheat varieties were (1) a very dry spring and an absence of beneficial rain during the

heading and ripening periods, and (2) the destructive influence of stem rust. As the main factor in the development of stem rust is humid weather with frequent falls of rain late in the season, the dry weather experienced in spring and early summer referred to would not appear to favour rust attack. The district in which these trials are conducted is an extensive one, and it was only in that section where the more favourable weather conditions obtained that stem rust caused a serious loss in yield. These centres were Cowra, Greenethorpe, and Canowindra.

The early-maturing varieties were again the most successful this season owing to their rust-escaping qualities and their ability to mature under dry conditions. Waratah has been the outstanding variety throughout the district, but found serious rivals this season in Nabawa and Duri. In fact at six widely separated localities where these three varieties were tried under exactly similar conditions the honours were with Nabawa, which averaged 24 bushels 13 lb., followed by Waratah, 23 bushels 49 lb., and Duri, 23 bushels 19 lb. Also at nine centres where Waratah and Nabawa were tried side by side the former averaged 24 bushels 35 lb., and the latter 24 bushels 44 lb. It is very evident that Waratah has a serious rival in Nabawa, and in a season favourable to flag smut would probably be beaten rather badly.

Duri has rivalled Canberra and performed well for the last three or four seasons, and can definitely be said to be superior to that variety in this district. At two centres it gave the highest yield of all varieties and appears to be a hardy variety. Riverina did very well this season, averaging approximately 1½ bushels less than the varieties named above. The highest yielding varieties were Nabawa at five centres, Waratah at four, Duri and Penny at two, and Duchess, Bobin, Ford, Gallipoli, Yandilla King, Marshall's No. 3, Canimbla, and Canberra at one.

Where rust was not present Bobin was also outstanding this season, particularly at Mr. F. Mulligan's farm at Trajere, where in a trial of ten mid-season varieties it headed the list by a margin of 4 bushels per acre. It is, however, very susceptible to rust, as evidenced in the trial on Mr. A. McKay's property at Greenethorpe, where a dense well-headed crop badly rusted and only returned 18 bushels 50 lb.—8 bushels less than Nabawa and Waratah.

Penny did remarkably well, outyielding all varieties in the Molong and Birriwa districts, but was rather badly beaten by a number of varieties in the Grenfell district this year, where it usually does particularly well.

Duchess, under exceptionally favourable conditions, gave the highest individual yield in these experiments this season. Where rust was present and the conditions very dry in spring, it suffered very badly. It is undoubtedly a "fair weather" wheat.

Of the mid-season varieties, Bena did well where conditions were not severe. Rust reduced its yield very considerably in the Cowra and Canowindra trials. The variety which gave particularly bad results this season was Union. This was due to disease attack, chiefly stem rust. A considerable area of this variety was sown in the Greenethorpe district,

and it was responsible for bringing the average yield down very materially in that locality. The most promising variety in the mid-season class appears to be Ford. Although rather tall-growing, it is apparently disease-resistant, hardy and high yielding. With a yield of 28 bushels it outyielded all varieties in a trial at Greenethorpe, and yielded well at all centres where tried this season and last.

Of the late varieties Yandilla King, Marshall's No. 3, and Turvey all did well. Exquisite, although it has some excellent qualities, will not fill if the end of the season is dry, and the grain comes in pinched and light. Where the season is favourable throughout very high returns may be expected from this variety.

Oat Variety Trials.—The season was favourable for oats, excellent yields being obtained.

Mulga was included in all grain trials, and at eleven centres averaged 36 bushels 27 lb. Buddah, its most serious rival, at nine centres averaged 36 bushels 19 lb. Palestine, a short-strawed grain variety, did remarkably well, this being its first season's trial, and it has much to recommend it. Gidgee plots were exceptionally good throughout the district until rust appeared and reduced the yield at some centres by quite 50 per cent. The low yields at Tyagong, Bogalong, and Greenethorpe were due to rust. On the other hand, where rust was not present, and the season particularly dry at the finish, Gidgee gave excellent yields, as, for instance, on the farms of Maroney Bros., H. McDonald, and D. O'Neill. Of the newest varieties, Laggan gave the highest returns, outyielding four other varieties in the Greenethorpe district. Owing to the very dark colour of the grain it is not likely to be popular with farmers.

Manurial Experiments.—These experiments were mainly to determine the most payable amounts of superphosphate to apply to wheat. Quantities varied from 56 lb. to 170 lb. per acre, and the results were in favour of an application of 80 lb. per acre. In thirteen trials this quantity gave the highest yield at four centres, and approximately that quantity, viz., 74 and 84 lb., came out best at two additional centres. Bigger quantities gave the highest yields (not necessarily the most economical return) at six centres. The additional yield with quantities over 100 lb. were hardly sufficient to warrant the expense, and it can be stated fairly definitely from the results of these trials over the last three years that about 80 lb. superphosphate per acre is, for most classes of soils, the most profitable application.

North-western District.

J. A. O'REILLY, H.D.A., Agricultural Instructor.

Branches of the Agricultural Bureau throughout the north-west co-operated with the Department in carrying out variety trials with cereals during the past season. At centres where there was no branch of the Bureau, private farmers conducted the trials.

The following are the names of the farmers who co-operated. The branch of the Agricultural Bureau is shown in parentheses:—

Oat Variety Trials—

N. J. Kauter, "Forest Hill," Inverell (Bannockburn).
J. B. White, "Braymont," Boggabri (Braymont).
S. Rigby, "Gwyroi," Pallamallawa (Pallamallawa).
J. Cavanagh, "Roanoke," Curlewis (Nea Siding).
Boyer Bros., "Lone Pine," Boggabri (Wynella).
J. Newnham, Wee Waa (Wee Waa).
G. B. Tait, Mullaley (Dunnadee Creek).
R. McKenzie, "Melrose," Boggabri (Willala).
F. Mills, "Dalkey," Mt. Russell (Mount Russell).
D. Perrett, "Orange Grove," Gunnedah (Nobby Rock).
E. Dufty, "Austinmere," Bingara (Mount Rodd).
A. Orman, "Egliston," Narrabri (Eulah Creek).

Wheat Variety Trials—

F. Swain, "Melrose," Carroll (Carroll).
W. O. Manning, "The Pines," Curlewis (Nea Siding).
J. Barwick, "Carellan," Gunnedah (Kelvin).
L. Pryor, "Eriston," Gunnedah (Nobby Rock).
S. Carberry, "Cadarga," Narrabri (Culgoora).
R. Smith, "Kia-ora," Narrabri (Eulah Creek).
A. E. Philip, "Eularoi," Bellata.
W. McDonald, "Inverness," Gunnedah (Emerald Hill).
Cosh Bros., "Karoola," Pallamallawa (Pallamallawa).
W. K. Campbell, "Fassifern," Boggabri (Nandewar).
J. B. White, "Braymont," Boggabri (Braymont).
F. Shaw, "Biwondah," Gunnedah (Emerald Hill).
C. Evans, "Hamel," Boggabri (Wynella).
G. L. Howson, "Flat Rock," Bingara (Hall's Creek).
A. M. Paterson, "Green Hils," Delungra (Myall Creek).
L. Laird, "Roslyn," Boggabri (Willowdale).
J. H. McDonald, "Bonnie Doon," Moree.
W. Gilholme, Inverell (Gum Flat).
N. W. Webb, "Roselean," Wee Waa (Wee Waa).
J. Tome, "Lovely Vale," Inverell (Bannockburn).
T. E. A. Hubbard, "Mountain View," Gunnedah (Normanstone Well).
A. H. Campbell, "Beulah," Gunnedah (Mary's Mount).
J. Dyson, "Trelor Springs," Tambar Springs (Tambar Springs).
P. Finn, "Alpha," Mount Russell (Mount Russell).
F. Hayes, "Balgownie," Inverell (Oakwood).
T. McInerney, "Glencoe," Inverell (Nullamanna).
E. Jefferys, Inverell (Auburn Vale).

The Season.

The droughty conditions which prevailed throughout the north-west during 1927 were relieved by the advent of general rains, which commenced in October, 1927, and continued until May, 1928.

In many cases the crop sown in 1927 was fed off, and by a stroke of the springtooth cultivator or disc cultivator the foundation of a fallow was made. Good rains during the summer and autumn months and conditions

generally were conducive to excessive weed growth on the fallows, but in most cases the seed-bed was in good condition for planting. The rainfall for May, 1928, was light throughout the district and in isolated cases where the fallows were worked deeply to eradicate weeds a loss of surface moisture occurred and a faulty seed-bed resulted.

The subsoil was thoroughly saturated, and by the maintenance of a suitable mulch and the control of weed growth this moisture was conserved and stood the crop in good stead during the practically rainless months of August and September.

Boisterous hot drying winds were experienced during the first and second week of October. These conditions reduced the yields considerably throughout the district.

RAINFALL at the Different Centres.

—	Gunnedah Post Office.	Boggabri (J. B. White).	Narrabri Post Office.	Wee Waa Post Office.	Pallamallawa (W. E. Tonkin).	Delungra (A. M. Paterson).	Inverell Post Office.	Bingara Post Office.	Moree (J. McDonald).	Emerald Hill (W. McDonald).	Curlewis (C. Hathway).	Gunnedah (J. Barwick).	Narrabri (B. Smith).	Gunnedah (C. Beeson).
1927.					*During Fallow Period.*									
July ...	2	40	7	2	...	...	23	...	...	...	4	...	...	...
August ...	78	42	70	32	80	55	55	71	...	...	78	...	...	86
September ...	35	56	16	20	13	15	19	31	...	...	46	...	...	3
October ...	157	106	177	295	150	284	197	454	...	...	164	...	73	150
November ...	398	387	298	155	246	394	468	346	...	...	331	...	376	276
December ...	497	343	666	391	314	340	320	180	...	...	190	...	421	261
1928.														
January ...	142	268	90	221	350	312	538	361	230	...	188	73	119	62
February ...	579	597	1,297	574	526	545	629	779	478	...	343	736	757	557
March ...	592	487	554	422	418	195	186	362	158	...	460	698	556	358
Total on fallow...	2,480	2,326	3,175	2,112	2,056	2,140	2,435	2,584	866	...	1,813	1,507	2,302	1.753
1928.					*During Growing Period.*									
April ...	207	143	182	81	190	190	191	287	193	...	197	301	297	249
May... ...	...	24	66	21	44	56	80	65	...	32	...	104	38	23
June ...	302	333	306	252	378	355	460	407	322	183	274	403	467	287
July ...	250	226	241	213	234	247	294	328	161	302	295	228	174	241
August ...	...	...	...	6	...	32	...	14	...	...	...	17	...	...
September ...	5	...	7	...	7	7	37	19	...	...	3	13	...	...
October ...	97	96	75	...	...	183	264	171	40	64	...	51	...	108
November ...	...	...	...	...	...	113	257	171	...	...	...	...	...	...
Total on crop ...	861	822	967	573	853	1,183	1,583	1,462	716	581	769	1,117	976	908

Oat Variety Trials.

Guyra, Mulga and Buddah are the most suitable varieties for the north-west generally. They are quick maturing and are usually ready to harvest before the main wheat stripping commences. These varieties can be sown in March and fed-off till the end of June. The subsequent growth can be cut for hay or harvested for grain. It must be borne in mind that if this crop is sown early and not fed-off a good deal of waste occurs through lodging of the crop and shedding of the grain.

RESULTS of Oat Variety Trials.

Variety.	Bannockburn (N. J. Kauter).	Braymont (J. B. White).	Pallamallawa (S. Rigby).	Curlewis (J. Cavanagh).	Wynella (Boyer Bros.).	Wee Waa (J. Newnham).	Dunnadee Creek (G. B. Tait).	Boggabri (R. McKenzie).	Mount Russell (F. Mills).	Gunnedah (D. Perrett).	Narrabri (A. Orman).
	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.
Algerian ...	29 0	26 22	...	...	...	...	...	8 24	33 3	27 13	8 0
Buddah ...	31 10	33 37	22 30	...	22 4	9 10	13 14	4 25	17 5	23 33	...
Belar ...	20 25	...	...	...	...	20 25	...	...	...	...	...
Guyra ...	28 17	25 4	21 16	19 22	30 13	8 3	...	8 28	24 5	21 11	9 0
Lachlan ...	24 21	16 35	...	25 22	29 19	8 7	6 33	...	24 34	21 13	8 0
Mulga ...	...	...	21 38	28 39	21 22	7 27	8 38	7 35	25 12	27 25	9 0

Cultural Details of Wheat Variety Trials.

Curlewis.—Light red gravelly loam. Fallowed in 1927, having carried a crop of oats in 1926. Ploughed (sundercut) September, 1927; springtoothed January, 1928; harrowed February; combine sown 19th April, 39 lb. seed per acre. Turvey was sown at rate of 43 lb. per acre. Superphosphate at rate of 40 lb. per acre was applied. Seed bed in good condition, excellent germination resulted.

Carroll.—Soil light red loam, stony. Sown with wheat 1927, and fed off. Disc ploughed December, 1927; springtoothed January, February, March, April, and prior to sowing with disc drill on 11th May, 1928. Sown at rate of 50 lb. per acre.

Kelvin.—Soil grayish to dark red loam. Disc ploughed January, 1928, and springtoothed five times prior to sowing with combine 20th May, 1928. Seed sown at rate of 45 lb. per acre. Seed-bed in good order and excellent germination resulted.

Nobby Rock.—Soil dark chocolate loam. Previous crop wheat in 1927. Sundercut 3 inches in December, 1927; springtoothed January and February, 1928; seed sown 16th May at rate of 45 lb. per acre. Sown with combine and harrowed after. Germination very satisfactory; yields were reduced through hot winds in early part of October. Watchman, by virtue of its earliness, had matured its grain before the advent of these winds.

Culgoora.—Soil free working grayish to black loam, previously timbered with Belar. Cropped with wheat in 1927 and fed off. Land springtoothed November, 1927; disced January, also springtoothed towards latter part of month; disced again in March, and sown with combine on 26th April. Seed sown at rate of 45 lb. per acre.

Eulah Creek.—Soil silty loam sown with Sudan grass in 1925, wheat in 1927 and fed off. Disc ploughed November, 1927, and again in February; springtoothed six times between this and sowing on 10th May. Seed sown with disc drill at rate of 45 lb. per acre.

Bellata.—Soil red to chocolate loam sown with wheat in 1927 and fed off. Disc ploughed February, springtoothed March and April, and sown at rate of 45 lb. per acre on 4th May. Seed-bed was somewhat on loose side and

germination was retarded. Germination was satisfactory following rains later in the month. Currawa, Turvey and Marshall's No. 3 were affected by dry weather in August and September. These varieties should be sown three weeks earlier.

Emerald Hill (W. McDonald).—Soil red to light red loam cropped with wheat 1927 and fed off. Disc ploughed December and again in February; springtoothed March and sown with combine on 3rd May. Seed was sown at rate of 45 lb. per acre. Seed-bed was in good order. Fed off third week in June.

Pallamallawa.—Soil a free working grayish loam which was cropped with wheat last year. Sundercut December; springtoothed and harrow following three times; sown with combine on 12th June at rate of 50 lb. per acre.

Nandewar.—Soil gray silty loam carrying Yellow Jacket and Red Gum. Wheat sown in 1927 and fed off. Land mouldboard ploughed October and springtoothed seven times; sown with combine on 16th May at rate of 50 lb. per acre. Seed-bed was in ideal condition. Yields were reduced by dry weather. The early maturing varieties were damaged by frost during September.

Braymont.—Soil black clayey loam of a free-working nature. Wheat in 1926 and fallow in 1927. Mouldboard ploughed February, 1927, and harrowed April; springtoothed twice and harrowed twice in January, 1928; springtoothed February and March and also harrowed March; springtoothed and harrowed in April. The seed-bed was in ideal condition. Seed was sown with combine on 10th May at rate of 45 lb. per acre. The yield from Early Bird was seriously decreased as a result of frost injury.

Emerald Hill (F. Shaw).—Soil a chocolate loam sown to wheat in 1927 and fed off. Springtoothed October and subsequently worked seven times with springtooth cultivator and drag harrows. Seed was sown with combine on 21st May at rate of 45 lb. per acre. The yields were reduced as a result of hot winds in October, Ford suffering most.

Wynella.—Soil red loam, cropped for first time in 1927 and fed off. Land disc ploughed December and springtoothed January; disced lightly in February and springtoothed in April. Sown with combine at rate of 45 lb. per acre on 8th May. Seed-bed moist but somewhat loose.

Hall's Creek.—Soil red to chocolate loam, sown to wheat in 1927 and fed off. Disc ploughed October; springtoothed four times and harrowed twice; seed sown by means of loose box attached to springtooth cultivator on 15th May at rate of 50 lb. per acre. Germination was retarded due to the system adopted in sowing, but by the end of May the stand was satisfactory.

Myall Creek.—Soil black basaltic self-mulching loam overlying a yellow clay subsoil. Sown to wheat in 1926 and fallowed 1927. Mouldboard ploughed 23rd July, springtoothed 12th November, skim ploughed January, harrowed February, springtoothed 10th May, and harrowed. Seed-bed was clean, firm and moist. Seed was sown with disc drill on 30th June at rate of 40 lb. per acre.

Willowdale.—Brown clayey loam with self-mulching tendencies; sown with wheat in 1927 and fed off. Springtoothed February, March and April.

Seed was sown with combine on 18th May at rate of 45 lb. per acre. Seed-bed was moist and in good condition.

Moree.—Soil free-working grayish loam carrying Belar and Brigalow. Wheat in 1927, stubble burnt and disc ploughed December, about 3 inches deep; harrowed January and twice in February; springtoothed March and harrowed April; rigid tined May. Sown with combine on 8th May at rate of 48 lb. seed per acre. Seed-bed was in excellent condition. Yields of late-maturing varieties, Currawa, Penny and Cleveland, reduced by dry conditions.

Gum Flat.—Soil black to red basaltic loam, sown to maize 1926-27. Disc ploughed January, 1928; disced March; harrowed April; sown with combine on 9th July and harrowed after. Sown at rate of 50 lb. per acre.

Wee Waa.—Red to chocolate sandy loam, sown with wheat in 1927 and fed off. Disced October; springtoothed December, January and February; skim ploughed (mouldboard) April, and disced lightly in May. Sown with disc drill on 25th May at rate of 47 lb. per acre.

Bannockburn.—Soil medium red loam, sown to wheat in 1926 and 1927. Mouldboard ploughed February; springtoothed end February; sundercut March; springtoothed April; harrowed after each working. Seed was sown at rate of 55 lb. per acre on 7th June; Cleveland, Turvey, Cadia and Wandilla were sown with disc drill, the remaining varieties with combine.

Normanstone Well.—Soil light red loam; wheat in 1927, fed off. Springtoothed December and again twice between December and planting time. Sown with combine at rate of 48 lb. per acre on 23rd May. Seed-bed in good order.

Mary's Mount.—Soil red to chocolate loam, sown to wheat in 1926 and 1927. Disc ploughed December; springtoothed January and end February; harrowed April and springtoothed end April. Sown with combine at rate of 45 lb. per acre on 1st May. The seed-bed was moist but somewhat loose.

Oakwood.—Soil black basaltic loam; last crop wheat in 1925. Sundercut February, 1927; mouldboard ploughed June; sundercut February, 1928; disced lightly in May and harrowed. Sown with disc drill at rate of 45 lb. per acre on 27th May. Seed-bed moist and firm.

Nullamanna.—Soil red basaltic loam, cropped with wheat 1927 and fed off. Disc ploughed February, skimmed with disc and harrowed in May. Sown with disc drill on 19th June at rate of 48 lb. per acre.

Mount Russell.—Soil chocolate loam; light crop of wheat harvested in 1927, maize previously. Mouldboard ploughed January; springtoothed February and April; sown with combine at rate of 56 lb. per acre on 12th June. Seed-bed was firm and moist.

Auburn Vale.—Soil black basaltic loam, cropped with maize 1927-28. Maize stacks cut, raked and burnt, and land mouldboard ploughed 1st August, 1928, and harrowed before and after sowing. Sown at rate of 56 lb. per acre on 8th August with combine. Stand on all plots was light owing to loose seed-bed consequent on late ploughing.

Results of Wheat Variety Trials.

Variety.	Carroll (F. Swain).	Curlewis (W. O. Manning).	Kelvin (J. Barwick).	Nobby Rock (L. Pryor).	Culgoora (S. Carberry).	Eulah Creek (R. Smith).	Bellata (A. E. Philip).	Emerald Hill (W. McDonald).	Pallamallawa (Cosh Bros.).	Nandewar (W. K. Campbell).	Braymont (J. B. White).	Emerald Hill (F. Shaw).	Wynella (C. Evans).	Hall's Creek (G. L. Howson).	Myall Creek (A. M. Paterson.)	Willowdale (L. Laird).	Moree (J. H. McDonald).	Gum Flat (W. Gilholme).	Wee Waa (N. W. Webb).	Bannockburn (J. Tome).	Normanstone Well. (T. E. A. Hubbard).	Mary's Mount (A. H. Campbell).	Tambar Springs (J. Dyson).	Oakwood (F. Hayes).	Nullamanna (T. McInerney).	Mount Russell (P. Finn).
	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.
Annie ...	18 41	27 45	...	...	21 51	23 9	...	24 37	22 13	9 35	...	16 51	...	29 45	...	...	...	42 28	13 15	18 21	23 8	21 29	...	27 43	...	21 22
Bobin ...	16 1	27 20	21 31	14 47	18 16	21 12	18 53	25 37	18 59	...	30 4	14 37	14 50	24 51	38 15	...	...	43 31	...	...	21 14	16 26	...	...	...	...
Bena ...	...	...	...	14 55	19 15	19 22	...	...	...	14 50	25 32	...	14 11	...	36 39	...	...	39 35	8 54	15 41	...	24 5	...	...	...	24 54
Canberra ...	16 40	23 23	...	...	23 33	20 46	18 4	23 31	...	10 8	30 0	...	...	23 24	...	19 54	...	...	17 52	...	...	...	...	25 48	...	...
Cadia ...	...	...	...	...	...	...	...	...	21 47	...	24 1	...	...	...	33 45	...	...	40 36	...	15 36	...	...	...	25 53	13 14	23 37
Cleveland ...	...	...	...	...	...	...	...	...	18 26	...	...	...	...	...	23 10	...	13 15	39 2	...	16 37	...	...	...	27 9	16 26	26 32
Clarendon ...	...	16 59	18 49	14 51	...	20 29	...	24 53	...	8 40	...	18 44	...	...	27 16	11 43	19 29	29 17	...	11 27	...	15 43	13 28	23 1	...	24 19
Currawa ...	...	...	...	...	...	...	11 39	...	...	9 9	...	...	...	...	...	20 23	8 42	...	...	...	...	...	...	...	12 25	30 49
Duri ...	...	23 37	...	...	...	18 34	...	...	...	9 2	...	...	...	28 30	...	...	...	...	...	...	21 36	...	...	...	...	...
Early Bird ...	17 52	23 16	21 22	...	...	26 32	...	18 41	20 1	4 3	14 31	...	...	19 46	...	...	24 15	32 47	15 35	...	18 2	20 37	18 8	...	8 0	...
Exquisite ...	...	...	19 57	...	...	...	...	...	...	...	...	...	...	...	...	17 2	...	...	...	...	16 0	...	...	28 57	11 31	29 57
Federation ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	23 28	...	...	...	...	...	...	...	...	...	...
Ford ...	...	...	21 5	...	18 41	...	...	...	...	...	...	11 0	15 58	...	32 18	...	...	...	...	...	...	...	...	32 4	...	...
Gullen ...	...	...	...	14 16	...	...	...	15 14	...	...	...	...	...	...	...	...	...	...	17 2	...	...	...	...	...	...	...
Gresley ...	...	...	...	...	...	20 36	...	19 37	...	...	...	...	...	26 5	...	20 46	...	...	...	...	...	20 17	...	...	...	...
Hard Federation ...	...	21 42	...	...	17 24	21 40	19 34	20 53	...	...	...	18 6	16 12	34 4	...	21 33	...	...	...	...	21 4	19 54	...	...	...	...
Marshall's No. 3 ...	...	...	...	...	...	...	11 3	...	17 31	...	...	...	...	...	...	...	...	40 59	...	...	...	...	...	...	...	30 31
Nabawa ...	18 2	...	23 41	16 19	...	...	...	...	...	15 47	30 18	15 35	16 13	...	34 28	20 41	...	...	9 8	18 51	21 37	19 6	...	32 40	...	31 22
Nizam ...	...	...	21 28	17 35	15 54	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Onas ...	...	...	24 9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	42 31	...	...	19 18	...	...	...	...	...
Penny ...	...	...	...	...	...	...	...	...	...	...	27 38	...	...	...	32 58	...	14 47	...	...	...	...	...	...	...	...	...
Rajah ...	...	...	...	...	12 47	...	17 4	...	22 14	...	...	...	14 11	24 14	...	...	...	...	...	...	...	...	18 8	...	...	...
Ranee ...	...	...	...	...	17 46	20 6	14 4	...	21 6	...	...	...	12 4	27 12	...	...	18 27	...	...	...	...	...	17 26	...	12 8	...
Turvey ...	...	30 2	...	...	...	...	11 27	...	...	...	...	...	12 50	25 13	...	...	...	...	...	18 52	...	...	...	...	...	...
Union ...	...	...	...	15 51	...	...	14 52	...	21 40	16 2	...	14 36	13 17	...	...	21 54	17 39	...	15 1	...	...	17 3	...	...	11 17	...
Waratah ...	16 25	24 0	21 47	17 48	20 9	18 43	...	24 4	20 27	10 23	31 34	15 46	15 33	...	39 21	20 16	18 23	37 55	17 53	17 6	21 5	19 28	17 47	30 0	11 15	25 0
Wandilla ...	...	...	...	13 43	...	...	...	...	...	12 0	...	...	...	...	...	...	...	...	...	15 37	...	...	...	...	...	...
Watchman ...	...	...	...	20 0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	20 19	17 5	21 56	...	...	...	...	...
Barwang ...	...	19 45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Auburn Vale (W. Jeffreys): Bena 18 bus., Canberra 15 bus., Cadia 12 bus., Cleveland 15 bus., Clarendon 12 bus. 20 lb., Early Bird 21 bus., Ford 19 bus., Penny 7 bus., Waratah 17 bus., Wandilla 17 bus. 30 lb.

Tambar Springs.—Soil heavy gray loam; wheat in 1926. Disc ploughed December, 1927; springtoothed February; disced June. Seed sown 5th June at rate of 60 lb. per acre. Plots fed off lightly first week in July.

Diseases.

Flag smut was the most prevalent disease in the plots this season. Nabawa, Wandilla, Clarendon and Bobin showed greatest resistance, while the disease was very noticeable in Watchman, Waratah, Aussie, Canberra, Hard Federation, Cadia and Cleveland.

Loose smut was evident in Canberra, Hard Federation, Cleveland, Union, Waratah, Nabawa, Wandilla and Bobin.

The season, generally, was not suitable to the development of rust.

Comments.

The plots at Curlewis and Auburn Vale were the only ones on which superphosphate was used, the application being 40 and 56 lb. per acre, respectively.

From the results of these trials and from a study of the climatic conditions which prevail in the north-west it is evident that a slight advance in the sowing period and the use of mid-season and early-maturing varieties are important factors in the production of wheat in this district. While the yields of the late-maturing varieties in these trials are not comparable with those of the early and mid-season maturing varieties, it serves to show that maximum yields cannot be obtained from these late-maturing varieties unless they are sown in mid-April. These remarks apply to that section of the north-west from Werris Creek to Pallamallawa, and includes Wee Waa, but not the Inverell district.

The outstanding varieties in the trials were Waratah, Aussie, Bobin, Canberra, Hard Federation, Nabawa and Union.

In the Inverell district Cadia yielded slightly better than Cleveland, but it shows no improvement on its parent as far as resistance to flag smut is concerned.

Watchman, on account of its earliness, scored well. It is susceptible to flag smut.

Onas yielded satisfactorily. At Kelvin it did particularly well.

Duri compares very favourably with Canberra from a yielding standpoint, and is stronger in the straw.

Exquisite was sown out of season and did not yield its best.

Gresley yielded consistently well where included.

Bobin, a new Departmental production, the result of a cross between Thew and Steinwedel, possesses, to a large degree, the qualifications necessary in a variety to suit conditions in the north-west. These qualities are early maturity, short strong straw, stamina and resistance to disease, and ability to hold grain, combined with yielding capacity.

Western District (Northern Section).

R. W. McDIARMID, H.D.A., Manager, Coonamble Experiment Farm.

During 1928 the following farmers co-operated with the Department of Agriculture in conducting cereal experiments in this district:—

T. A. Butler, Ryheem, Teridgerie.
R. Johns, Ule Wallen, Baradine.
E. Ferguson, Yahringerie, Bugaldi.
A. Salisbury, Coralyn, Purlewaugh.
F. Corderoy, Pilton, Purlewaugh.

Mainly owing to the late sowing, the plots on Mr. T. A. Butler's farm were a failure, while those on other farms did not show up to best advantage.

The Season.

The season was a particularly harsh one in all districts, but good yields were obtained when the crops were sown early on well-prepared land that had been suitably fallowed. Heavy rains were experienced during the summer and autumn months, and where the fallows had been correctly worked a plentiful supply of moisture was conserved. The germination in most cases was good, and the growth very rapid during the winter. After July an excessively dry period was experienced till after harvesting, only 104 points being registered during August, September, and October. The boisterous windstorms experienced during these months accentuated this dryness and caused a great reduction in yields.

Cultural Details.

Teridgerie.—Medium red loam, cropped for four years, previous crop wheat, 1927, fed off to sheep. Disc-ploughed and harrowed in January; springtoothed in February and March and harrowed; disced in April to destroy roly poly and then harrowed; sown with combine. Sown 14th to 15th May at rate of 53 lb. seed per acre, one plot of Canberra receiving 60 lb. superphosphate. Wheat failed to mature. No apparent difference in manured plot.

Baradine.—Gray to chocolate crumbly loam, clay subsoil; second crop, wheat, 1927, fed off to sheep. Springtoothed late October; disc-ploughed late January; springtoothed March; sown with combine 3rd and 4th May at rate of 60 lb. wheat and 65 lb. oats, one plot of Canberra being fertilised with 60 lb. superphosphate. Germination was good and yields fair. Harvested 5th and 6th November. Turvey and Bena tipped badly and grain pinched. Ploughing in January made seed-bed too loose and open. All varieties would have done better if sown earlier.

Bugaldi.—Gray sandy loam on edge of creek; eight crops; plots 1927 were a failure and fed to sheep. Mouldboard-ploughed November 4 inches

deep; harrowed November and December; sheeped till March; mouldboard-ploughed April; disced late April; late and mid-season varieties sown 1st May; balance disced early May and sown 15th May, wheat at rate of 53 lb. and oats at 50 lb. per acre, superphosphate being applied at the rate of 50 lb. to the early and 70 lb. to the late varieties. Fallow was worked with the object of destroying couch grass rather than to conserve moisture. Germination was good. Watchman very early and badly frost-bitten. All varieties except Waratah showed second growth. Oats gave a particularly good sample of grain. Plots practically a failure compared with crops on better worked land and sown earlier.

Purlewaugh (A. Salisbury).—Light-red sandy loam not previously cropped. Mouldboard-ploughed August, 1927; springtoothed full depth September; harrowed October; springtoothed November, January, March, and mid-May. Soil in good condition, moist and friable. Sown 17th and 18th May at 53 lb. seed per acre for all varieties except two plots of Riverina, which received 70 lb. All plots except two of Canberra and one of Riverina given 50 lb. superphosphate. One plot of Canberra given 70 lb. ephos phosphate. Germination good with forward growth till spring, when all varieties felt the dry spell. Crops on older land did not tip so badly. Harvested 13th and 14th November.

Purlewaugh (Corderoy Bros.).—Medium red loam, old land. Disc-ploughed December, 1926, 4 inches deep; springtoothed January; disced March; harrowed April; sown to wheat and fed off bare. Mouldboard-ploughed 4 inches deep December, 1927; springtoothed January; harrowed January and February; springtoothed February; scarified May. Soil in tip-top order, moist and clean. Sown 18th and 19th May at 50 lb. oats, with 60 lb. superphosphate per acre. Germination good, but sowing in several plots very irregular. Algerian and Belar benefited by late rains when the others were ripening. Better results would have been obtained if sown earlier.

Wheat Variety Trials.

Canberra was consistent in all three centres, very little trouble being experienced from disease.

Waratah was also successful in all trials, giving a good sample of grain.

Federation yielded well at Baradine, but was inferior to the earlier maturers at the other centres. It should be sown early in April.

Cleveland has shown itself to be suited to the Purlewaugh district, but should be sown early in April for best results.

Riverina and Nabawa are becoming more popular and are giving good returns with a high resistance to flag smut.

Watchman, a new variety to the district, showed promise, but being very early was badly frost-bitten. The yield, however, was comparatively good.

RESULTS OF WHEAT VARIETY TRIALS.

Variety.	Baradine.		Bugaldi.		Purlewaugh.	
	bus.	lb.	bus.	lb.	bus.	lb.
Canberra	22	19	12	32	16	16
Waratah	19	10	10	18	19	46
Federation	20	39	7	13	14	13
Marshall's No. 3	......		11	11	12	18
Union	......		7	43	......	
Cadia	......		9	15	......	
Watchman	......		8	23	......	
Aussie	20	2	......		......	
Turvey	13	31	......		......	
Bena	7	35	......		......	
Nabawa	18	39	......		......	
Ford	......		......		13	39
Exquisite	......		......		15	58
Cleveland	......		......		20	0
Riverina	......		......		19	28

Fertiliser Trials with Wheat.

A small manurial trial with Canberra wheat was included in the variety trials, and at Purlewaugh a trial with Riverina was also carried out. In three out of the five trials the application of superphosphate resulted in an increase in yield more than sufficient to meet the cost of the superphosphate, but in the other trials the reverse was the case. At Teridgerie, where all plots were failures, no apparent difference could be noted in the manured section, and at Purlewaugh, where Riverina was used as the variety, a decrease in yield of over 3 bushels was obtained. Quite possibly this large difference was caused by the heavy seeding (70 lb. per acre) exhausting the moisture content of the soil quicker in the fertilised plot. The application of ephos phosphate gave a small increase, but not sufficient to justify its use.

Experiments with superphosphate in the north-west have shown that its use is not followed by the same increase in yield as in the southern districts, and farmers are advised to try superphosphate on their own farms on a small area, as apaprently the response is not the same on all soils, and in many cases the amounts could perhaps be reduced to smaller applications of about 28 lb.

RESULTS OF FERTILISER TRIALS.

Fertiliser per acre.	Baradine.		Bugaldi.		Purlewaugh (Canberra).		Purlewaugh (Riverina).	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
60 lb. high-grade superphosphate ...	22	19	12	32	......		16	27
50 " " " " ...	......		......		16	16	......	
70 lb. ephos phosphate	......		......		15	14	......	
No manure	17	8	10	20	14	33	19	28

Oat Variety Trials.

Oats for grain were tested at three centres, the yields in most cases being low. Guyra, a mid-season variety, proved most successful, and can be recommended for the district, as it produces a good plump sample of grain. Algerian, a late variety, showed up very well at Purlewaugh, but was a distinct failure at Baradine, where the early types are to be favoured. If green feed, grazing or silage is required, the early-maturing Mulga or Sunrise is more successful.

RESULTS of Oat Variety Trials.

Variety.	Baradine.	Bugaldi.	Purlewaugh.
	bus. lb.	bus. lb.	bus. lb.
Guyra	12 37	28 23	20 35
Algerian	3 19	......	25 22
Mulga	......	25 32	14 37
Lachlan	3 19	......	17 20
Buddah	......	......	15 39
Belar	......	......	15 6

Northern District.

MARK H. REYNOLDS, H.D.A., Senior Agricultural Instructor.

THE following farmers co-operated with the Department in carrying out variety, manurial, and seeding trials during 1928:—

Wake Bros., Gowrie—Wheat and oat variety trials.
I. C. Thornton, Currabubula—Wheat variety trial.
Thrift Bros., Parkville—Wheat and oat variety trials.
W. Bomen, Manilla—Wheat, oat and barley variety trials.
P. G. Pearson, Murroon—Wheat and oat variety and fertiliser trials.
Scott Bros., Currabubula—Oat variety trial.
R. T. Abra, Garthowan—Wheat and oat variety trials.
H. Gregg, Garthowan—Wheat and oat variety trials.
G. Hombsch, Warral—Oat variety and fertiliser trials.
G. Forge and Sons, Warral—Wheat variety trial.
C. Luckett, Duri—Wheat variety and fertiliser trials.
A. J. Lye, Loomberah—Wheat and oat variety trials.
J. H. Pankhurst, Attunga—Wheat and oat variety and rate of seeding trials.
W. Bignell, Manilla—Wheat and oat variety and fertiliser trials.
Smith Pollock, Quirindi—Wheat and oat variety trials.
W. Smith, Warrah Creek—Wheat variety trial.
H. Wright, Singleton—Oat variety trial..
V. J. Reading, Duri—Oat variety and wheat rate of seeding trials.
U. Greenwood, Quirindi—Oat variety and wheat rate of seeding trials.
W. B. Donaldson, Currabubula—Wheat rate of seeding trial.
W. H. Lye, Loomberah—Wheat rate of seeding trial.
H. J. Woolaston, Warral—Oat fertiliser trial.

The Season.

The rainfall from November, 1927, to April, 1928, was ample for cultural operations and for crop requirements. On the gray and light red loams that run together after rain, and which become fine when cultivated, the rainfall

of February and March especially, and, in some instances, that of April, caused waterlogging and setting down, which factors were detrimental to the crop. The self-mulching soils stored much of the abundant rains, but in May the rainfall was deficient for such types of soils, as the moisture quickly leaves the surface of these soils, and they crumble into coarse particles, making germination difficult. However, where rolling or sheep tramping was resorted to a better strike resulted. In the case of some crops the stand was thin, due to a faulty strike in May. The growth was generally rank, but a number of crops were not fed off owing to stock not being available.

A very dry spring from the end of July to mid-October materially reduced the yield. Generally, the rainfall recorded was under 1 inch for these three months, and an unusually strong hot wind blew from 7th to 9th October. However, the evidence of stem rust to a mild extent on most crops indicated that a normal spring rainfall would have caused severe losses from this disease, especially on account of the rank nature of the growth at the end of winter. Flag smut made its appearance, especially on Canberra, Aussie, and Waratah, but in only a few instances was it severe. Generally speaking, there was little disease, partly due to the preceding dry season, and quite a number of crops were fed off while green in order to provide sheep feed. Slight traces of loose smut and septoria were noted. Take-all and foot-rot were mildly prevalent, but not as severe as in past seasons.

RAINFALL.

	During fallow to 31st March.	During growth from 1st April.
	points.	points.
Wake Bros., Gowrie	800	1,064
W. B. Donaldson, Currabubula ...	941	1,110
Thrift Bros., Parkville	1,500	1,239
I. C. Thornton, Currabubula	442	1,070
Scott Bros., Currabubula	1,199	1,249
W. Bomen, Manilla	2,545	1,051
P. G. Pearson, Murroon	1,410	1,171
R. T. Abra and H. Gregg, Garthowen ...	1,355	......
H. G. Woolaston, Warral	998	915
G. Hombsch and Forge & Sons, Warral...	998	915
C. Luckett, Duri	954	906
V. J. Reading, Duri	1,266	743
W. H. Lye, Loomberah	1,300	777
A. J. Lye, Loomberah	2,013	777
J. H. Pankhurst, Attunga	2,158	1,198
W. Bignall, Manilla	1,553	1,055
S. Pollock, Quirindi	663	1,075
N. Greenwood, Quirindi	1,770	1,226
W. Smith, Warrah Creek	475	1,491
H. Wright, Singleton	1,035	1,150

Wheat Variety Yields.

As far as possible these tests were divided into early, mid-season, and late-maturing varieties, three or more of each being tested at different centres.

Yandilla King was taken as the standard long season variety, and emerged from the tests at least equal in merit to any other. In the case of the mid-season varieties Union was the standard, but owing to susceptibility to rust and flag smut will be supplanted by Nabawa. Of the early varieties, Waratah is at present the standard and perhaps the most popular variety.

In the long season varieties Exquisite made a good showing. It was sown early in May, but should have been sown in early April. It is a medium high variety, with long compact ears which droop markedly. Cadia is another long season variety worthy of note. It yielded well, and exhibited comparative freedom from rust and flag smut. Bena proved a prolific yielder, but was also subject to rust and flag smut, while Canimbla, Wandilla, and Currawa still continue to promise well.

Barwang showed up well in the mid-season varieties, while of the short season varieties Ranee again yielded satisfactorily. This is the third year in succession that this variety has performed well. Rajah, Bobin, and Aussie were also outstanding this season. The first-mentioned showed considerable freedom from flag smut, although adjoining crops of Bena and Duchess were severely affected. Canberra is still popular owing to its high yielding qualities. Several crops were entirely free from disease, whereas others were considerably reduced in yield by flag smut.

YIELDS of Wheat Variety Trials.

Variety.	Gowrie.	Parkville.	Warral.	Currabubula.	Baldwin (Manilla District).	Manilla.	Garthowan (R. T. Abra).	Garthowan (H. Gregg).	Warral.	Loomberah.	Warrah Creek.	Quirindi.	Murroon.	Duri.	Attunga.
	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.
Yandilla King ...	28	...	...	...	...	...	...	...	...	...	35½	...	15	...	27
Cleveland ...	26	Failed	...	...	...	...	...	...	...	...	...	...	...	...	...
Cadia ...	25	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Union ...	28	...	...	23	...	...	...	...	...	...	...	...	...	...	...
Turvey ...	...	15	...	...	...	...	...	...	12	...	36¾	...	17½	...	25
Barwang ...	...	10½	...	24	...	...	...	...	...	...	...	...	...	...	...
Bobin ...	...	7¼	...	...	...	...	28	35	...	...	...	...	...	...	...
Clarendon ...	...	9¾	...	...	...	...	...	...	...	...	...	...	...	27	...
Rajah ...	...	...	...	...	...	12	...	...	9½	...	...	...	...	...	...
Bena ...	...	...	...	...	...	12½	...	...	13	...	36	...	...	...	...
Wandilla ...	...	...	...	...	...	...	...	...	13½	...	...	...	14	...	21
Ranee ...	...	...	...	29½	...	...	...	...	...	...	...	...	...	...	...
Duchess ...	...	...	...	21	...	10¾	...	...	...	...	...	...	...	...	...
Ghurka ...	...	...	...	...	15½	...	...	...	...	...	...	...	...	...	...
Riverina ...	...	...	...	...	17	...	...	...	...	...	...	...	...	...	...
Aussie ...	...	...	...	...	18½	...	...	...	...	33¾	...	...	25½	...	...
Waratah ...	...	...	...	...	16	14½	28	24	...	...	...	...	...	31½	...
Canberra ...	...	...	...	...	20	...	19¾	37½	...	...	...	...	...	34	...
Nabawa ...	...	...	...	...	...	...	20½	33½	...	14½	...	...	...	29½	...
Florence ...	...	...	...	...	...	...	...	...	...	21¼	...	...	...	28¾	...
Ford ...	...	...	...	...	...	...	...	...	...	21¾	...	...	...	...	...
Bald Early	...	...	...	...	...	...	...	...	...	15	...	35	...	...	...
Gresley ...	...	...	...	...	...	...	...	...	...	...	...	36	...	...	...
Exquisite ...	...	...	...	...	...	...	...	...	...	...	...	31¼	...	...	...
Currawa ...	...	...	...	...	...	...	...	...	...	...	...	34½	...	...	...
Canimbla ...	...	...	...	...	...	...	...	...	...	...	34½	...	12¾	...	...
Hard Federation ...	...	...	...	...	...	...	...	...	...	...	...	...	26	...	...
Duri ...	...	...	...	...	...	...	...	...	...	...	...	...	24½	...	...
Penny ...	...	...	...	...	...	...	...	...	...	...	...	...	17	...	...
Marshall's No. 3 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	20

Oat Variety Trials.

The yields of the varieties under trial are given in the following table:

YIELDS of Oat Variety Trials.

——	Lachlan.	Buddah.	Belar.	Algerian.	Mulga.	Guyra.	White Tartarian.	Bugery.	Laggan.	Gidgee.	Myall.	Kelsalls.
	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.
Gowrie ...	12	Lost.	...	...	...	...	...	...	...	...	...	...
Parkville ...	...	...	6½	6½	4½	...	...	...	...	...	...	...
Currabubula ...	19	37	26	...	...	...	...	...	...	...	...	...
Manilla ...	...	...	...	...	...	19¼	Late.	...	...	...	...	...
Garthowan (R. T. Abra)	...	...	...	...	...	...	...	22	16⅓	...	...	...
Warral ...	14⅓	...	...	...	...	...	...	...	...	18½	...	...
Duri	...	...	...	21	...	...	...	24	...	21	...	...
Quirindi ...	...	...	35	...	...	37	...	...	...	...	...	...
Singleton ...	...	9½	10	15	...	10½	...	...	...	...	...	...
Baldwin ...	...	...	...	15½	...	...	...	...	...	...	24	...
Murroon ...	...	...	...	...	21½	...	...	...	...	26½	...	...
Attunga ...	...	...	...	35	...	...	...	...	...	...	...	32

Barley Trials.

The high yield and general excellence of the crop of Lansdown, at Baldwin, should encourage the further testing of this variety. Barley growing has been neglected in the district, and a yield of 40 bushels of barley, as compared with the return of 20 bushels from the best wheat variety, should encourage further attention.

YIELDS of Barley Variety Trial at Baldwin.

Trabut...	28 bushels per acre.
Lansdown	40 ,, ,,

Rate of Seeding Trials with Wheat.

Several tests were carried out, using 35, 50, and 65 lb. superphosphate per acre. The six trials showed practically no difference in yield, but owing to the encouragement given to weeds in the early stages of growth, when seedings are light, seeding at the rate of 50 lb. per acre is considered the standard at present. The 35 lb. seeding rate was not dense enough, while the tests also indicated that anything over 50 lb. per acre is uneconomical.

RESULTS of Rate of Seeding Trial.

Locality.	Variety.	Rate of Seeding per Acre.								
		35 lb.	36 lb.	45 lb.	50 lb.	51 lb.	55 lb.	64 lb.	65 lb.	68 lb.
		bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.
Currabubula ...	Waratah ...	...	20¾	...	...	21	...	...	...	22¼
Duri	Bena ...	18½	...	...	19	...	...	...	21¾	...
Loomberah ...	Waratah ...	...	...	12	...	...	14	...	10	...
Loomberah ...	Union ...	...	...	13	...	...	12¾	...	15	...
Quirindi	Duri ...	...	30	...	29	...	...	24⅓	...	...
Attunga	Bena ...	27	...	...	27	...	...	...	27½	...

Wheat Fertiliser Trials.

Results were obtained from only two of the trials conducted, and these showed no advantage was to be gained from the use of fertiliser. With the object of ascertaining the residual effect of superphosphate sown with oats on the succeeding crop of wheat, two oat fertiliser trials were carried out, but here again no improvement in grain yield was noted. In every instance, however, the early growth of both wheat and oats was more abundant where superphosphate was used, and this green feed proved to be richer than on the unfertilised areas.

RESULTS of Wheat Fertiliser Trials.

—	Yandilla King.		Canberra.	
	Unmanured.	Superphosphate 56 lb. per acre.	Unmanured.	Superphosphate 98 lb. per acre.
	bus.	bus.	bus.	bus.
Murroon	18	15	...	...
Duri	...	...	34	35½

RESULTS of Oat Fertiliser Trials at Warral.

—	Belar.	Lachlan.
	bus.	bus.
Unmanured	19¼	14⅓
84 lb. superphosphate per acre ...	19½	16

Cultural Details.

Gowrie.—Red-brown, medium, self-mulching loam from basalt, depth 6 inches with denser subsoil; sixteen years cropped without fertiliser, fallowed in 1926. Ploughed early January 4 inches; harrowed middle January; combined, 3 inches, early March and again mid-April. Wheat at rate of 50 lb. per acre and oats 40 lb. sown with combine in moist bed, no fertiliser. Good stand and stooling, fed off middle to end July. Union was harvested in the middle and the others at the end of November. Buddah lost through severe lodging, while Cleveland, Union, and Lachlan had their yields reduced by flag smut and rust.

Parkville.—Red-grey medium loam, boulder sedimentary, depth 5 to 7 inches over clay, cultivated several years. Ploughed middle December, portion in early January 5 inches, again February 5 inches, and early May 5 inches, each ploughing followed by harrowing. Sown 25th April with hoe drill, without fertiliser. Seeding, wheat 50 lb. per acre and oats 40 lb. per acre. Thin strike in part. Harvested middle November. Low yields attributed to waterlogging in June and deficiency of rain from July to mid-October.

Currabubula (Wheat Trial).—Dark-grey loam, old sedimentary from shale, average depth 5 to 7 inches with clay subsoil; many previous crops without fertiliser, 1927 crop fed off. Ploughed late February 3½ inches; harrowed last week March; combined 7th May in moist bed, using 52 lb. wheat per acre without fertiliser. Harvested middle November. Mildew considerably reduced the yield of Union and Duchess. Fed off by sheep, 2nd July to 3rd August, when close feeding removed the fungus, but the sheep neglected the two varieties mentioned after partly grazing them.

Baldwin (Manilla District).—Red medium loam from shale, depth 5 to 7 inches over clay. Several crops, all wheat, 1926 crop fertilised, 1927 crop fed off. Combined 3 inches on five occasions (2nd October, 3rd November, 4th January, 5th February, and 6th March), and combined 2 inches on 7th April and 19th May; sown with combine in moist bed, barley on the 19th, oats on 21st, and wheat on 28th May, without fertiliser, seeding rate being barley 45 lb., oats 40 lb., wheat 52 lb. per acre. Harvested late November. Through high wind causing lodging and shattering, about half the seed was shed of Trabut barley, Myall and Belar oats. The abundant pre-spring rains over-consolidated the soil, due to the shallow cultivations and the hot winds of October, together with the dry spring, materially affected the yield.

Manilla.—Light-red medium loam from shale, average depth about 5 to 6 inches; sown with wheat many years, 1927 crop being oats without fertiliser. Disc ploughed mid-January 3½ to 4 inches very moist; mouldboard ploughed early March 3 inches moist; combine cultivated 3 inches on 18th May; sown with combine on 25th May in moist seed bed at rate of 60 lb. seed per acre without fertiliser. Harvested 23rd November.

Garthowan (R. T. Abra).—Red to grey medium loam from shale, average depth about 6 inches, wheat for twenty years, pasture last four years without fertiliser, 1927 being pasture. Ploughed 10th February 4 inches; spring-toothed 24th March, again 30th April; sown with combine in a moist seed-bed. Oats sown on 12th and wheat on 22nd May, no fertiliser being used. Seed sown at the rate of 40 lb. oats and 61 to 66 lb. wheat per acre. Harvested 7th to 14th November.

Garthowan (H. Gregg).—Black to dark-grey medium sedimentary, several feet depth of soil; old cultivation without fertiliser, 1927 wheat crop being fed off. Springtoothed January, 2½ inches, likewise twice February and on 21st March, usually ten days after rain, also mid-April; sown with combine 21st to 24th May, in moist seed-bed, using 61 lb. seed and no fertiliser. Oats lodged badly and was hayed. Harvested on 12th November.

Quirindi (Variety Trials).—Black, heavy self-mulching loam from basalt, deep; cropped sixty years without fertiliser. Mouldboard ploughed 4 inches first week February; harrowed first week March; scarified 4 inches early April; harrowed late April; sown with combine 1st May, seeding rate being 50 lb. without fertiliser; harrowed separately. Fed off bare in late July. Harvested earliest varieties first week November, late maturers last week

November. Late maturity and rust affected yield of Exquisite. Reid oats (late maturer) unsuitable because of poor yield and uneven ripening, whereas Mulga yielded approximately 25 bushels.

Warrah Creek.—Red to brown, medium heavy, self-mulching soil from basalt, 7 inches deep over clay; cropped several years, 1927 crop was oats without fertiliser, and one-third wheat unfertilised (cross sections). Ploughed, 4 inches, early March; springtoothed, 3 to 4 inches, on 22nd March; sown with combine on 22nd April, using 53 lb. seed and no fertiliser. Fed off 9th to 12th June and 10th to 13th July, when grazed fairly short. Harvested early November.

Murroon.—Soil gray to red loam from shale, about 6 inches over clay; several wheat crops, those of 1925 and 1926 manured with 56 lb. superphosphate; Fulghum oats and rape in 1927, unfertilised, fed off till December. Mouldboard-ploughed 4 inches late December; fearing erosion no further cultivation performed till combined 3 inches late February; scarified 2 inches on 9th April; sown with combine 27th April, in moist bed, 45 lb. wheat, 42 lb. oats seed being used, also 56 lb. superphosphate; portion of Yandilla King was not fertilised. Harvested mid-November. Frosting in September and dry hot winds in early October reduced yields.

Warral (Wheat Variety Trial).—Red, medium heavy, part self-mulching loam from shale, 6 inches over clay; cropped several years, 1926 being fallow and 1927 wheat, unfertilised and fed off. Mouldboard-ploughed 3 inches early January; combined 3 inches late March; sown with combine 21st April, in moist seed-bed, using 48 lb. seed wheat and no fertiliser. Harvested mid-November. Rajah, in particular, attacked by grasshoppers throughout.

Duri (Wheat Variety and Fertiliser Trials).—Chocolate heavy self-mulching soil from shale and basalt, 8 inches over denser strata; cropped several years, 1926 fallow, 1927 crop fed off. Ploughed 4 inches and harrowed late December; harrowed late February; springtoothed late February; combined 24th May, with drag harrow, seeding rate being 60 lb. wheat per acre; Canberra was used in the fertiliser trial. Harvested third week November. Florence shed about one-quarter bushel.

Loomberah (Wheat and Oat Variety Trials).—Gray soil mostly, rest light red, medium loam from shale, 6 inches over clay; cropped several years, 1926 sheeped, 1927 not cropped. Ploughed 3 to 4 inches early September; combined 3 inches late November and again in January and March; sown with combine 30th April to 1st May, in moist bed at the rate of 57 lb. wheat and 45 lb. oats per acre, no fertiliser being used. Harvested 7th to 13th November. Shattering reduced yield of Florence. Yields also reduced by frosting.

Attunga.—Light red, medium, slightly self-mulching soil from shale, 7 inches over clay; cropped some years, 1927 crop fed off by early September. Springtoothed 3 inches on 2nd and 15th December; 2½ inches on 21st

February and 17th April; sown with combine in moist bed 23rd to 30th April. Harvested 31st October. Lost a quantity of Kelsall's oats through weak straw and grain lean. All varieties slightly pinched.

Currabubula (Oat Trial).—Red, medium, slightly self-mulching loam from shale and basalt, 6 inches over clay; cropped thirty years without fertiliser. Ploughed 4 inches late December; skim ploughed 3 inches on 4th February; combined 3 inches on 2nd March, and again 2½ inches on 30th April; sown with combine on slightly moist bed 8th to 9th May, using 40 lb. seed oats per acre, unfertilised. Lightly fed off. Harvested Buddah on 2nd November, Belar on 16th November, and Lachlan on 25th November. Lachlan sown too late for feeding off and grain production, and suffered most from hot October winds, many heads being empty and otherwise grain badly pinched.

Currabubula (Rate of Seeding Trial).—Soil black-brown, heavy self-mulching loam from basalt, deep; cropped many years without fertiliser, 1927 crop being oats unfertilised. Ploughed early February about 4 inches; ploughed 8th May 3 inches; harrowed twice in May; sown with disc-drill 28th May, and sheeped to draw moisture to seed, not fertilised. Harvested mid-November.

Duri (Oat Variety Trial).—Red, medium, self-mulching loam from shale and basalt, 5 to 6 inches over clay; portion cropped many years to 1914, remainder under pasture till last year. Ploughed early November 4 inches; harrowed late December; ploughed February 3 inches; sown with combine in moist seed-bed 1st to 4th May, seed being 40 lb. Budgery and 60 lb. Gidgee without fertiliser. Fed off bare early July. Harvested 10th to 12th November.

Duri (Rate of Seeding Trial).—Cultural details similar to oat variety trial. Sown with combine in moist bed 1st May, without fertiliser; fed off bare early July; harvested mid-November.

Quirindi (Rate of Seeding and Oat Variety Trials).—Light red, medium loam, 5 to 6 inches over stiffer soil, old sedimentary formation; thirty years cropped, 1927 crop fed off, fertilisers not being used. Scarified 3 inches late October and again in early January; twice combined 3 inches in February; scarified 2½ inches mid-March; sown with combine in moist bed, oats on 11th April and wheat on 5th June, seeding rates being oats 45 lb. with 56 lb. superphosphate per acre, Duri wheat with 56 lb. superphosphate per acre. Oats lightly fed off when Duri wheat seeded. Harvested oats early in November and wheat on 22nd November. Guyra, through lodging, lost about 3 bushels, and Belar, through being tough to thresh, had a similar loss per acre.

Singleton (Oat Variety Trial).—Sandy loam from sandstone, 12 inches over medium clay; cropped many years, 1927 being oats not fertilised, and fed off green. Mouldboard-ploughed 5 inches mid-January; disced 3 inches mid-February and mid-March; broadcasted and covered by harrow, 70 lb. seed and 112 lb. superphosphate. Fed off till mid-August; harvested early

December. This plot was mainly intended to demonstrate early maturing oats for feeding off. Early growth taller in varieties over the check Algerian. For grain production the late feeding off was harmful, especially in the case of Buddah and, to a less extent, Belar and Guyra.

Warral (Woolaston's Oat Fertiliser Trial).—Red, medium loam from shale; cropped several years, 1927 being wheat, unfertilised, and fed off. Springtoothed 3 inches mid-January and again early May; sown with combine in partly dry seed-bed 14th May, using 40 lb. seed and 100 lb. superphosphate per acre. Harvested late November.

Warral (Hombsch's Oat Variety and Fertiliser Trials).—Red medium, self-mulching loam; cropped some years, 1927 crop failed through hail. Disc-ploughed 3½ inches late January; harrowed 27th February; spring-toothed 2½ inches 26th March; sown with combine in moist bed on 27th April, using 40 lb. seed in variety trial, and 84 lb. superphosphate per acre in the fertiliser trial. Harvested Gidgee in late October and Lachlan on 27th November. The fertiliser produced more early growth. The spring-toothing in March was delayed by rain; the portion done after the rain showed an improved yield of 2 to 3 bushels per acre.

Loomberah (Rate of Seeding Trial).—Red, medium loam from shale, 6 inches over clay; cropped several years, 1927 crop fed off. Combined 2 inches late December; ploughed early May 3 inches; combined and harrowed 2½ inches June, sown with combine in moist bed without fertiliser. Yields marred by very dry spring and hot winds in October, only grew to 18 inches high. Fit to harvest on 25th November.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

Orange (G. Williams)	April 16, 17, 18
Wingham (D. Stewart)	,, 17, 18
Grafton (L. C. Lawson) ...	,, 17 to 20
Hawkesbury (R. B. Tate) ...	,, 18, 19, 20
Buladelah Bureau (F. Coleman)	,, 19, 20
Wellington (N. Cook)	,, 23, 24
Maclean (T. B. Notley	,, 23, 24
Kempsey (E. Mitchell)	,, 24, 25, 26
Stroud (C. E. Price)	,, 26, 27
Casino (P. W. Swanson) ...	,, 30, May 1, 2
Dungog (W. H. Green)	May 1, 2, 3
Kyogle (D. Campbell)	,, 8, 9
East Gresford (A. R. Brown) ...	,, 10, 11
Trangie (A K. Butter)	,, 15, 16
Forbes Sheep Show (K.O. Anderson)	July 10, 11
Cootamundra Sheep Show ...	,, 24, 25
Peak Hill (T. Jackson) ...	,, 30, 31
Young Sheep Show (T. A. Tester)	,, 31, Aug. 1
Tullamore (A. N. Cornett) ...	Aug. 7, 8
Trundle (W. P. Forrest) ...	,, 13, 14
Illabo	,, 14
Lake Cargelligo	,, 20, 21
Condobolin (J. M. Cooney) ...	,, 20, 21
Wagga (F H. Croaker) ...	,, 20, 21, 22
Junee (G. W. Scrivener) ...	Aug. 27, 28
Bogan Gate (J. T. A'Beckett) ...	,, 28
Ungarie	,, 28
Grenfell	,, 27, 28
West Wyalong	Sept. 3, 4
Parkes (L. S. Seaborn)	,, 3, 4
Young (T. A Tester)	,, 4, 5
Ganmain (C. C. Henderson) ...	,, 10, 11
Forbes (K. O. Anderson) ...	,, 10, 11
Cowra	,, 10, 11
Barmedman	,, 11
Canowindra	,, 17, 18
Temora	,, 17, 18, 19
Murrumburrah	,, 24, 25
Barellan	,, 25
Boorowa	,, 26, 27
Ardlethan	Oct. 2
Quandialla	,, 2
Narandera (J. D. Newth) ...	,, 8,
Ariah Park	,, 9
Bribbaree	,, 9
Griffith	,, 15, 16
Carcoar	,, 16
Cootamundra	,, 22, 23

A Skin Disease of Sheep (*Mycotic Dermatitis.*)

H. R. SEDDON, D.V.Sc., Director of Veterinary Research.

ANY disease which affects the skin of sheep must be considered serious in Australia, a country which is so dependent upon wool for its prosperity. And the purpose of this note is to call attention to a disease which has not hitherto been recognised, probably because of its comparative rarity. The fact that it has been found in several widely separated localities, and that it is infectious in nature, renders it of some importance.

The disease is termed *Mycotic dermatitis*, being caused by a mould or fungus which gets into the wool follicles and causes the heaping up on the skin of thick scabby masses which bind the wool together. The back seems a favourite situation, and, though in some cases the scabby areas may be small in size, they are many in number, and cases have come under notice where the greater part of the skin of the back and sides is affected.

In the early stages the wool may present no change, but when the wool covering such an area is grasped the thick scabby masses on the skin may be felt. On examining more closely there will be found a crust or scab, yellowish in colour, which may be up to 2 inches thick, binding the wool fibres together and firmly adherent to the skin. Later, these crusts separate from the skin and may be pulled off along with the wool, leaving a raw area which is very liable to become fly-blown.

Scab from Back of Sheep affected with Mycotic Dermatitis.

The cause of the condition appears to be a mould or fungus, for such can be detected, in sections of the skin, burrowing down into the wool follicles, and it is present in quantity in the crusts. Also, the condition may be set up by rubbing a paste of the crusts on the skin, especially after scarification (which assists penetration of the fungus).

The disease bears a strong resemblance to favus (a form of ringworm), which produces a similar type of scab on the skin of mice, rats, cats, and occasionally in other animals.

The treatment of sheep would hardly be a practical proposition as it would entail shearing and repeated dressing. With only odd animals affected, it is much better to destroy them and to burn the carcases. A specimen of affected wool may be seen at the Stock Branch, Department of Agriculture, 56 Bridge-street, Sydney.

The accompanying photograph of a scab removed from the back of a sheep gives a good idea of the manner in which the base of the wool fibres is matted together by the growth of the fungus on the skin.

Palatability Trials at Hawkesbury Agricultural College.

To ascertain the preference shown by sheep, under field conditions, for the more important varieties of oats, as compared with one another, and also as compared with other winter cereals, tests were carried out at Hawkesbury Agricultural College during 1925, 1926, 1927 and 1928.

The results of the trials may be summarised as follows:—

1. In the early stages of growth the order of choice by sheep was rye, wheat, Skinless barley, and oats.
2. In the later part of the season most of the varieties of oats were just as palatable as wheat.
3. Oats produce a bigger body of feed either for grazing or soiling.
4. For palatability, earliness of grazing, and bulk of feed produced, early maturing varieties of oats are to be preferred.
5. Of the oat varieties, Mulga and Guyra proved to be the most palatable. Kelsalls, although excellent in appearance, was entirely avoided by the sheep.
6. Mulga oats provided excellent grazing, doing well throughout the trial. The variety is very early and produces as great a bulk as any of the later maturing varieties.
7. Algerian oats withstand grazing very well, but they are too late to provide sufficient bulk of feed early in the winter, and they appear to be inferior to the earlier varieties of oats. Although unpalatable in the early stages they are more readily eaten later in the season.
8. Mulga is preferable to Sunrise.
9. Cape barley is inferior to oats, as once the awns appear it is not eaten.

E. S. Clayton, Senior Experimentalist.

Infectious Diseases Reported in February.

The following outbreaks of the more important infectious diseases were reported during the month of February, 1929 :—

Anthrax	Nil.
Blackleg	6
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia contagiosa	7
Swine fever	Nil.
Contagious pneumonia	Nil.

— Max Henry, Chief Veterinary Surgeon.

Black Disease.

GRAHAME EDGAR, B.V.Sc., McGarvie Smith Research Scholar.*

BLACK disease, it will be recalled, was investigated by the late Dr. Sydney Dodd, who found in the livers of animals dead of black disease a bacillus to which he ascribed the disease. He noted also the association of the disease with liver fluke infestation. This bacillus is now accepted as the cause of black disease, for the examination of material submitted to Glenfield Veterinary Research Station has shown it to be constantly present (see page 6 of Veterinary Research Report, No. 2, published as Science Bulletin, No. 26) and, further, that the disease is related to recent fluke infestation seems undoubted.

There has, however, been much speculation as to the manner in which the bacilli get into the animal and as to the exact part played by the liver fluke. Losses from black disease occur at the period of the year during which the young liver flukes gain entrance to the liver, and as the young fluke has to bore its way through the stomach wall and into the liver it might be supposed that the bacilli causing black disease follow along the path made by the young fluke. Due consideration of such an hypothesis, however, made it appear difficult to appreciate how the organism could thus enter the liver. In view of this it was decided to conduct bacteriological investigations upon the livers of apparently normal sheep from districts in which black disease is known to occur. The initial investigations were carried out at Glenfield Veterinary Research Station upon a number of sheep which had been obtained from a southern district of the State. These sheep were affected with stomach worm, but no losses from black disease had occurred in the flock either prior to or after arrival at Glenfield, though several died from the effects of stomach and intestinal worms. Some of these sheep were killed, and, with due aseptic precautions, cultures were made from the livers, as a result of which it was found that black disease bacilli were actually present in some of the livers. Cultures were next made from sheep which were known never to have been in a black disease district, but no black disease bacilli were found in them.

Following these observations, sheep were examined from the northern, western, and southern tablelands. The animals selected were mostly apparently healthy sheep, and though some of these were from properties on which black disease is known to occur, none of the sheep (at the time of killing) showed lesions of black disease or appeared ill in any way, except that some were wormy and others affected with fluke. An important finding, however, was that black disease bacilli were found only in sheep from districts where black disease is known to occur.

* An account of investigations carried out at Glenfield Veterinary Research Station.

In the livers of these healthy sheep it would appear that the bacilli may get into the liver quite independently of the young fluke and that they may remain there, probably in a resting or spore stage. In this state they appear to cause no ill effects. When, however, young flukes bore into the liver, they damage it, causing haemorrhage and destruction of cells. These damaged areas would be areas of low vitality, and it would appear that if the spores are present in such an area they might germinate and so set up black disease.

Just how and when the black disease bacilli gain entrance to the sheep has not been determined, but it may be mentioned that the bacillus has been cultivated from soil, and it would appear that this is its natural habitat. It might, therefore, easily be taken in with the food.

It must be pointed out that the whole chain of evidence is as yet incomplete, but some light has been thrown upon an important point in the causation of the disease and again emphasises the great importance of methods which aim at the control of liver fluke, viz., treatment of sheep with carbon tetrachloride and the destruction of snails by the bluestoning of springs and watercourses. In previous accounts of work undertaken at Glenfield Veterinary Research Station it has been pointed out that to get the full measure of success from these methods a certain amount of draining and channelling must be done to destroy all harbour and allow the treated water to reach the snails.

"Sugar Manual, 1928."

We have received from the Dependable Publishers Ltd., London, a copy of the new and enlarged edition of the "Sugar Manual." It contains a concise epitome of all details and statistics relating to the production and marketing of sugar, as well as complete and up-to-date particulars of sugar companies in different parts of the world. It is a useful book for traders and others interested in the sugar industry.

Banana Squashes in Demand.

For some considerable time now the Department has been advocating the growing of banana squashes. This squash is an early cropper and is superior in both yield and quality to the Hubbard squash, its chief disadvantages being its shape and the fact that it is something new as far as the public is concerned, and anything new in the line of vegetables has a lot of prejudices to overcome. The past season, however, gave growers of the banana squash a splendid opportunity to place their product before the consumer, there being a shortage of cucurbitaceous crops because of the unfavourable season and the ravages of the pumpkin beetle. The response on the part of the consuming public was remarkable in many localities, buyers demanding the banana squash in preference to the better-known Hubbard variety. In some districts, prices up to 4s. 6d. were obtained.—J. Douglass, Agricultural Instructor.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36A, G.P.O., Sydney, not later than the 12th of the month.

Wheat—

Aussie	... J. Parslow, Balladoran.
Canberra	... E. J. Johnson, Wongalea.
	B. J. Stocks, Cunningar.
	W. W. Watson, Tichborne.
	Manager, Experiment Farm, Condobolin.
	W. G. Law, Thistledown, Gilgandra.
	T. R. Jones, Birdwood, Forbes.
Clarendon	... C. T. Anderson, Swan Vale.
Cleveland	... W. Burns, Goongirwarrie, Carcoar.
	Manager, Experiment Farm, Bathurst.
Federation	... H. J. Harvey, Dubbo.
	E. J. Johnson, Wongalea.
	B. J. Stocks, Cunningar.
	W. W. Watson, Tichborne.
	W. G. Law, Thistledown, Gilgandra.
Firbank	... Manager, Experiment Farm, Trangie.
Gresley...	... Manager, Experiment Farm, Bathurst.
Marshall's No. 3 ...	... W. Wolter, Ryan, *via* Henty.
	B. J. Stocks, Cunningar.
Nabawa	... Cullen Brothers, Dubbo.
	H. J. Harvey, Dubbo.
	T. W. O'Brien, Junee Reefs.
	Quirk and Everett, Wellington.
	J. M. Gollasch, Milbrulong.
	J. Carruthers, Armatree.
Onas	... J. M. Gollasch, Milbrulong.
Queen Fan	... C. T. Anderson, Swan Vale.
Riverina	... Cullen Brothers, Dubbo.
	W. G. Law, Thistledown, Gilgandra.
Turvey	... B. J. Stocks, Cunningar.
	W. W. Watson, Tichborne.
	W. G. Law, Thistledown, Gilgandra.
Union	... B. J. Stocks, Cunningar.
	Manager, Experiment Farm, Temora.
	J. M. Gollasch, Milbrulong.

Wheat—continued.	
Wandilla	H. J. Harvey, Dubbo.
	Quirk and Everett, Wellington.
Waratah	R. O. Stiles, Narromine.
	E. J. Johnson, Wongalea.
	T. W. O'Brien, Junee Reefs.
	B. J. Stocks, Cunningar.
	Wallder Brothers, Tullibigeal.
	W. W. Watson, Tichborne.
	Manager, Experiment Farm, Condobolin.
	T. R. Jones, Forbes.
	J. M. Gollasch, Milbrulong.
	C. T. Anderson, Swan Vale.
	G. T. Troy, Bland, Quandialla.
	Manager, Experiment Farm, Temora.
Yandilla King...	R. O. Stiles, Narromine.
	H. J. Harvey, Dubbo.
	B. J. Stocks, Cunningar.
	Quirk and Everett, Wellington.
	W. Wolter, Ryan, *via* Henty.
	J. M. Gollasch, Mibrulong.
Oats—	
Algerian	C. Bennett, Forbes Road, Cowra.
	Manager, Experiment Farm, Temora.
Belar	Manager, Experiment Farm, Temora.
Budgery	Manager, Experiment Farm, Bathurst.
Guyra	Manager, Experiment Farm, Bathurst.
Lachlan	Manager, Experiment Farm, Temora.
Mulga	C. Bennett, Forbes Road, Cowra.
	A. P. Unger, Alectown.
	J. M. Gollasch, Milbrulong.
White Tartarian	Manager, Experiment Farm, Bathurst.
Barley—	
Cape	Manager, Experiment Farm, Bathurst.
Rye—	
Black Winter	Manager, Experiment Farm, Bathurst.
Tomatoes—	
Sunnybrook Earliana ...	A. E. Johnson, Green Valley, *via* Liverpool.
Onions—	
Early Improved Hunter River	S. Redgrove, Sandhills, Branxton.
Early White Hunter River ...	S. Redgrove, Sandhills, Branxton.
Hunter River Brown Spanish	C. J. Rowcliffe, Fairfield, Dubbo.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

THE GOVERNMENT'S EFFORTS TO REVIVE THE BANANA INDUSTRY.

THE division of the banana-growing area into zones and the provision of inspectors should not be regarded as a system of policing, but should be interpreted by growers as an honest effort on the part of the Government to render assistance and protection to the growers against the indifferent individuals in their midst, and to represent the only method by which satisfactory revival of the industry can be achieved.—C. P. MAGEE, Assistant Biologist, at the Murwillumbah Agricultural Bureau Conference.

Orchard Notes.

April.

C. G. SAVAGE and H. BROADFOOT.

Growers in the whole of our apple and pear growing districts are now busy picking, packing, and marketing fruit, and very many, perhaps most, are seized with the importance of handling and packing it carefully and marketing it attractively. It is absolutely necessary that the grower, in his own interests, should pack his fruit unbruised and with the skin unbroken, otherwise loss will result. Rot organisms will get in their disastrous work, and the decomposition resulting from their activities will spread to a greater or less extent to other fruit in the case, even though the latter has been picked, packed, and handled carefully. Fortunately, most of our apple and pear growers are fully aware of these important facts. For those who ignore them, unpleasant experience awaits. For the sake of the inexperienced let these elementary packing reminders be reiterated:—Pick carefully, avoid abrasions and punctures, pack firmly, and handle gently. Pack so that there will be a slight bulge on top and bottom of the case. Stack the cases on their sides. Generally speaking, it is advisable to wrap all apples of good quality whose diameter is 2¼ inches or over. Wrapping makes tight packing easier. By acting as a buffer, the paper lessens compression of the fruit, whilst giving a tighter pack.

Preparing Land for Planting.

Preparation of the land for planting fruit trees should be painstaking, patient, and thorough. Ploughing must be to a sufficient depth, sufficiency depending upon the nature and depth of the soil and the nature of the subsoil. The soil should be thoroughly broken up and allowed to remain in the rough, so that, exposed to the beneficial influences of sun, rain, air, and frost, it may be sweetened and improved in its chemical content, and so that it may absorb and hold the winter rains. Later, as a result of the influences referred to, it will respond to the orchardist's efforts to induce a good tilth.

Planting.

In localities where frosts are unknown during autumn, and where that season is mild, citrus trees may be planted during the month of April. Avoid injury to roots and drying of roots during the process of planting. It will be necessary to water the newly-planted trees in dry soil, thus helping them over the critical period of establishment in their new position. Loss of soil moisture is lessened by the beneficial process of mulching. Do not place undecomposed manure in contact with the roots. Manure, if used at the time of planting, should be thoroughly mixed with the soil. When planting refills, a large hole should be dug and filled with fresh soil.

Re-soiling.

This is a beneficial operation, especially to citrus trees, whether practised alone or in conjunction with applications of manure or fertilisers.

Liming.

If quicklime is used for this highly desirable and beneficial operation it should be distributed in heaps over the land and covered with soil. When it is properly slaked it should be evenly scattered over the surface and cultivated in. The covering should be shallow. Growers who think of applying lime should first obtain Farmers' Bulletin 115, "Lime on the Farm," price 7d., post free, from the Department.

Tubercle-free Herds.

Of the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number tested.	Expiry date of this Certification.
Department of Education, Hurlstone Agricultural High School ...	33	1 Mar., 1929
Australian Missionary College, Cooranbong	57	24 ,, 1929
J. F. Chaffey, Glen Innes (Ayrshires)	58	2 May, 1929
F. W. Hopley, Leeton	25	14 ,, 1929
P. F. Mooney, Calala	33	16 ,, 1929
Department of Education, Gosford Farm Homes	16	16 ,, 1929
William Thompson Masonic School, Baulkham Hills	29	23 ,, 1929
Lunacy Department, Parramatta Mental Hospital	93	6 June, 1929
E. P. Perry, Nundorah, Parkville (Guernseys)	26	12 ,, 1929
Dominican Convent, Moss Vale	4	26 ,, 1929
Sacred Heart Convent, Bowral	10	21 July, 1929
St. Patrick's College, Goulburn	8	26 ,, 1929
Presbyterian Ladies College, Goulburn	4	26 ,, 1929
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	42	9 Aug., 1929
Kyong School, Moss Vale	2	21 ,, 1929
Department of Education, Mittagong Farm Homes	34	23 ,, 1929
Blessed Chanel's Seminary, Mittagong	4	25 ,, 1929
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	75	25 ,, 1929
Walaroi College, Orange	5	30 ,, 1929
Riverstone Meat Co., Riverstone Meat Works, Riverstone	127	5 Sept., 1929
J. L. W. Barton, Wallerawang	22	11 Oct., 1929
W. McLean, Unanderra	41	1 Dec., 1929
Department of Education, Eastwood Home	9	5 ,, 1929
Lunacy Department, Morisset Mental Hospital	21	7 ,, 1929
J. Davies, Puen Buen, Scone (Jerseys)	89	12 ,, 1929
Kinross Bros, Minnamurra, Inverell (Guernseys)	78	14 ,, 1929
Lunacy Department, Callan Park Mental Hospital	22	19 ,, 1929
Miss Brennan, Arrankamp, Bowral	14	20 ,, 1929
E. S. Cameron, Big Plain, Narandera	39	10 Jan., 1930
A. Shaw, Barrington	36	11 ,, 1930
Lunacy Department, Rydalmere Mental Hospital	66	11 ,, 1930
New England Girls' Grammar School, Armidale	22	16 ,, 1930
Lunacy Department, Kenmore Mental Hospital	81	28 ,, 1930
G. Miller, Casula	15	1 Feb., 1930
Department of Education, Yanco Agricultural High School	82	23 ,, 1930
Tudor House School, Moss Vale	8	6 Mar., 1930

—Max Henry, Chief Veterinary Surgeon.

Poultry Notes.

April.

E. HADLINGTON, Poultry Expert.

POULTRY-FARMERS who have learned the wisdom of early hatching will be busy this month selecting the breeding stock and getting them settled down in their quarters ready for a final choice at the end of the month or early in May. Many hens, of course, will not be through the moult, but these can be penned up later when they are ready.

This work is one of the most important phases of poultry-farming because upon the selection of the right class of breeding stock depends the quality and physique of the next season's young birds. Therefore, the greatest care and consideration should be given to the selection and mating of the breeders.

Look for the Weaknesses.

Now is the time to note the result of last year's work, and if any weaknesses are apparent, or have been observed since last hatching season, steps must be taken to effect improvement. A few of the questions which should be considered are: Is the flock laying up-to-grade eggs; were the hatching results satisfactory last year, or was there an undue proportion of dead-in-the-shell; did the chickens thrive well, or were there indications of lack of stamina; and, looking over the resultant pullets and cockerels now, are they as well developed and robust as they should be?

It matters not what egg strain or blood lines are being worked upon, if there are signs of degeneration, now is the opportunity for remedying matters. In cases where there is a large percentage of undersized hens which are laying small eggs it may take several years to build up again, as it is much easier to lose ground than to rectify such physical deficiencies. It may even be better in some instances to work up again from new stock rather than rely entirely upon attempting to resuscitate the run-down flock. The mistake should not be made of thinking that it is only necessary to introduce a few large male birds to achieve that result. There is no such short cut to rehabilitate a flock lacking in physique and laying small eggs without losing in egg production. The only way is to make a careful selection of the best specimens and introduce birds of a like type which are known to be bred from stock of sound physique and which are laying large eggs. Even this may result in a somewhat lower egg production for a year or so, but this is preferable to a complete breakdown. Following the introduction of new blood a rigid selection is necessary each year thereafter to ensure that only those birds which show the desired qualities are used.

After all, successful breeding of poultry depends largely upon keen observation and the application of commonsense methods. By judicious selection much can be done towards the elimination of small eggs which make a great difference to the income from a poultry farm. This was brought home to some farmers last export season owing to the minimum weight for export

being fixed at 1¾ ounces. Not that this State suffers more in this respect than other States, but the fact remains that there is a fairly high percentage of eggs produced which do not come up to the desired standard, and it behoves every poultry-farmer to strive in his own interests to increase the size of eggs.

Factors Affecting Size of Eggs.

One of the factors which is having a detrimental influence on the size of eggs is the indiscriminate purchase of day-old chickens. Some poultry-farmers purchase the cheapest chickens obtainable, under the impression that one chicken is as good as another. If, however, they paused to consider that all the birds on a farm are not by any means suitable to breed from, and that chickens from selected stock cannot be sold as cheaply as those where the production of numbers to meet demands results in the putting up of all and sundry stock as breeders, they would exercise more care in their purchases.

Fortunately all vendors of day-old chicks do not belong to the latter class, and there are many who desire to give their customers a "fair deal," but the tendency to purchase cheap chickens makes it difficult for them to compete without coming down to the same level in quality.

The only way under present conditions for purchasers of chickens to afford themselves some measure of protection is to make an inspection of the farms from which they contemplate securing their supplies of chickens, and note the class of stock on the farm. Such inspection would be welcomed by those who have good stock and endeavour to supply dependable chickens.

Flock Matings.

The practice of "flock-mating" is another cause of inferior stock and should be avoided as far as possible.

Where large flocks of breeders are used there cannot be the same selection for quality and other desirable characteristics as in a single breeding pen, and every effort should be made by poultry-farmers to use single breeding pens (eight to twelve females to one male, according to the breed) for producing their main breeding stock for the following year. By doing this, and using the progeny each year from the single breeding pens instead of from flock mating, a great improvement can be effected not only in the quality of the birds, but also in egg production, because a better selection for uniformity should be possible, which is one of the factors bearing upon the breeding of consistent high layers.

It stands to reason that with the wide diversity of types and different characteristics which can be observed in any large flock of birds there can be no stabilisation as regards any particular character in their progeny.

Points on Selection of Breeders.

There are many poultry-farmers who have worked up a large flock, and yet who are not conversant with the points they should look for, or which birds they should reject when picking out the breeding stock. A few points on the subject may therefore be of assistance.

The first essential is a working knowledge of the type of the breed being kept, because whatever may be said or argued to the contrary, type is a fundamental of breed and without some idea of this essential no uniformity is possible. The birds selected should conform as nearly as possible to one type, and this applies to the male as well as the female bird.

In going through the flock, the birds, which on outward appearances are what is desired, are picked out; then follows a process of elimination. They should be examined for bad faults such as "spriggy" combs, eyes or lobes of the wrong colour, feathers on the shanks or between the toes (in breeds which should be free from such), and deformities like crooked toes or badly crooked breasts, &c. If they pass in these respects, their weight, which is an important guide to physique, must be taken into consideration. In the case of light breeds the minimum weights required are pullets 4 lb., cockerels 5 lb., hens a year older and cocks of the same age should weigh 1 lb. heavier. Heavy breed pullets should be not less than 5 lb. and cockerels 7 lb., hens and cocks being 1 lb. heavier. If a reasonable standard of physique is being maintained there should be no difficulty in obtaining the weights mentioned in pullets and cockerels at ten months of age, at which time they are old enough to breed from.

Next comes the question of laying characteristics, and with a little experience and judgment it is a fairly simple matter to pick out the good from the bad layers among birds which have reached maturity.

The head points of a bird are one of the best and most reliable guides when selecting the layers, and whether the birds being selected are bred from tested layers or not, they still require to be picked over carefully. The indications of a good layer are a large prominent eye which stands out well from the face, a fine skull, fairly long and deep face free from wrinkles and excessive feathering, and comb and wattles of reasonably fine texture.

Other points are that the body should be of good depth and width, in keeping with the type of the breed, and the skin of the abdomen should be soft and smooth. The general appearance of the high producer is alert and active. The poor layer will be the opposite in all these respects.

In selecting the male birds the same points should be looked for. A coarse, inactive class of bird will not produce good layers.

Management of Breeding Stock.

After the breeding stock has been selected and penned up, this is by no means the end of the work. The male birds should be dusted with an insecticide to free them from body lice, and if any of the hens are infested they also should be treated. Dusting ordinary flowers of sulphur thoroughly through the feathers is one of the best measures for ridding the birds of body lice. The male birds should be examined as the season progresses to see that there is no further infestation, as good results cannot be expected from a pen in which the male is troubled with these parasites. The houses should also be kept free of red mites.

The next consideration is the feeding of the breeders, which has a very important bearing upon hatching results. The food should not contain a

high percentage of concentrates, 4 to 5 per cent. of any highly concentrated ingredient being as much as should be given to breeding stock. Careful feeding as regards quantity is also essential as neither underfed nor overfed birds will give satisfactory results.

Then the male bird requires special attention to see that he receives sufficient food to keep him in good condition. It often happens that he allows the hens to eat the food whilst he struts around. To ensure that he eats as much as required, the head of the pen should be given a feed of whole maize by himself at mid-day. To do this the best course is to shut the hens in the house and give the male a feed in the yard. In exceptional cases it may be advisable to give every feed in the same way.

Onion Trials at Wollongbar Experiment Farm.

That onions can be grown in the Lismore district is shown by the results of field trials carried out at Wollongbar Experiment Farm during last season, and the fact that one or two growers in the locality are profitably producing the crop. Hunter River White and Hunter River Brown Spanish may reasonably be expected to yield well in most seasons, and, while the keeping quality is not the best, this is no great handicap, as the crop can be disposed of for local consumption. With the adoption of careful cultivation methods, the ensuring of a compact seed-bed and the rigid control of weeds, the possibility of the extension of onion growing in this district seems reasonably assured.

In the variety trial carried out at Wollongbar farm, the seed was sown in seed-beds on 13th March, 1928, and transplanted on 17th April in rows 14 inches apart, no fertiliser being used.

The season was a favourable one, the plots receiving the benefit of good rainfall conditions, especially during the early period of development. Weed growth was kept in check throughout the growing period.

The rainfall was as follows:—March (13th to 31st), 212 points in 8 days; April, 854 points in 16 days; May, 381 points in 17 days; June, 515 points in 11 days; July, 663 points in 9 days; August, 273 points in 6 days; September, 31 points in 2 days; and October (1st to 8th), 51 points in 1 day.

Harvesting was carried out on 8th October, 1928, the following yields being obtained:—

	tons	cwt.	qr.	lb.
Hunter River White	6	13	3	20
Hunter River Brown Spanish (A. McKimm)	6	2	3	2
Early Improved Hunter River Brown (S. Redgrove) ...	4	5	2	7
Hunter River Brown Spanish (J. C. Rowcliffe)... ...	3	14	1	17

These results are quite satisfactory, and it is probable that greater yields would have been obtained had the plants been placed closer together, although that may have resulted in somewhat smaller individual onions. The excellent growth and quality of the white onion were particularly noticeable. This white onion is a selection from Hunter River Brown Spanish, made by Mr. S. Redgrove, of Branxton.—S. C. Hodgson, Experimentalist.

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Agricultural Gazette of New South Wales.

Wheat-growing on the Mallee Lands of New South Wales.

E. S. CLAYTON, H.D.A., Senior Experimentalist.

THE term mallee is applied to particular types of stunted eucalypts of peculiar habit of growth. The typical mallee consists of stunted trees growing in clumps, four or more stems coming from the one clump of roots. As a rule the smaller the diameter of the trees the greater the number occurring on the same root clump, and in the case of fine whipstick mallee ten to twenty small trees may be growing out from the one base. The timber generally occurs in these clumps, but interspersed between them may be found single specimens of ironbark, stunted pines and other timber, also porcupine bush, &c.

Mallee country usually presents an infertile drought-stricken appearance, and the trees afford very little shade considering the amount of foliage they possess. In the natural state practically no grass grows in the mallee, and on the lighter types of soils no permanent streams are to be found, due largely to the fact that this country absorbs water very rapidly. The fact that this type of country in the virgin state is almost entirely without water and grass provides sufficient explanation for its avoidance by early settlers, who, of course, greatly preferred the open timbered country, which was more pleasing, more fertile, better grassed and watered, and easier to handle.

In fact, with the exception of some of the mallee land around Wyalong, this class of country has been strictly avoided in New South Wales until comparatively recent years. In this respect the history of the mallee development in New South Wales is following that of Victoria. In that State the mallee was so forbidding that it was not taken seriously in hand until most of the suitable wheat country had been developed, and now this despised unpromising mallee country is producing in the aggregate more wheat than any other part of Victoria. It is now regarded as the granary of the State, and to date has produced over £50,000,000 worth of wheat. Victorian mallee presented even greater difficulties than that of New South Wales. It received an annual rainfall of twelve to sixteen inches, and was so porous that practically no water could be conserved; there was not sufficient run off in many instances to fill a dam, and it was only after a scheme of supplying water from lakes in other areas to the mallee for domestic and stock supply was perfected, that the mallee could be developed at all. In New South Wales, however, the position is not quite so severe. Here with the heavier rainfall and slightly less porous soil it is possible to fill dams. All that is needed is proper catchment areas with drains leading the water to the dams.

It is found in New South Wales that the unpromising and even forbidding exterior appearance of the mallee is no true indication of its value for wheat production; in fact it disguises soil fertility of no mean order,

soil that has the power when correctly worked to yield wheat on lower rainfall than any other class of country. The saying that "one inch of rain on mallee land is as useful as 1½ inches on other wheat country" has some justification in actual fact, as was demonstrated in New South Wales during the dry year of 1927.

Then, again, so far as its physical difficulties are concerned there are many settlers who choose the mallee in preference to the more attractive looking pine and box country, maintaining that it is much easier to clear and prepare for cropping than green forest country. It must be said that a new settler can in one season roll a large area of mallee and crop it. Up to 700 acres have been rolled, burnt and sown within twelve months by one settler. This, of course, is not possible on forest country.

Bull Mallee.

Showing a typical clump of bull mallee. This timber usually grows on heavy soil, which is generally considered to be good wheat country.

Although much can be said for and against mallee it is evident that it possesses wonderful possibilities in the hands of men who understand it. This understanding, however, is essential, and it is considered unwise for a settler to take up mallee country unless he has had previous experience. If he is determined to take mallee he will be well advised to gain his experience by working for others in a mallee district. This advice is given because the mallee presents problems singularly its own, and it yields its harvest only to those who have the knowledge and the heart to demonstrate its productiveness.

This once despised mallee country is at last receiving the attention its possibilities warrant. It is quite easy to understand the prejudice that formerly existed, and in some cases still persists in the minds of New

South Wales farmers against this uninviting, unpromising and depressing country. The unbroken monotony of the stunted timber which completely shuts in the vision of the traveller, the harsh nature of the undergrowth (spinifex, &c.), and the almost complete absence of grass and herbage, the apparently infertile soil, and the extreme scarcity of water made the mallee sufficiently repulsive to ward off the settler and cause him to seek more promising localities. However, the wheat-growing possibilities so effectively hidden by nature behind this formidable barrier were at last

Whipstick Mallee.

The photograph shows whipstick mallee interspersed with porcupine bush (sometimes called spinifex).

Broom bush Mallee.

This type usually grows on poor gravelly or shaley soil, which is not considered to be good wheat country as a rule.

discovered and demonstrated by a few adaptable and determined settlers. The mallee country in New South Wales has already demonstrated its wheat-growing possibilities, and it is now being developed in earnest. Its fertility is undoubted. Victorian mallee farmers coming to this State eagerly snap up this country that they understand so well, and they are high in their praise of it. The general opinion is that on the mallee lands in New South Wales the soils are heavier and more fertile than those of Victoria.

The success that has already been achieved on this class of country inclines one to believe that there is a very bright future in store for our large areas of mallee lands.

Types of Mallee.

Different types of mallee are to be found in New South Wales; each type is usually associated with a certain type of soil, but there is much overlapping of types. As a rule, however, the taller and larger diametered mallee is found on the heavier and more fertile types of soil, while the light and sparse mallee usually grows on lighter soils. The following general types of mallee occur:—

Bull Mallee.—This is one of the tallest and stoutest mallees. It usually grows in clumps of three or four trees, but grows to good height—sometimes 20 feet or more. The trees are usually 6 inches or more in diameter, and are therefore very hard to deal with. This type of mallee always requires a considerable amount of axe work in nicking the trees before they can be

A Farm-made Mallee Roller.
It will be seen that the construction provides for a side pull.

successfully rolled. It usually occurs on fairly heavy and fertile country, which makes very good wheat land. Land carrying this class of mallee is generally considered excellent wheat country.

Whipstick.—This variety of mallee occurs on a wide range of soils; usually, however, it will be found that on the lighter soils it will only grow to a height of about 8 to 10 feet and be roughy 1 or 2 inches in diameter, while in the heavier and more fertile soils it will grow taller and stouter.

Fine whipstick mallee is usually considered fairly easy to roll and handle. It is generally on good wheat country.

Spar Mallee.—Occurs occasionally, and is often found interspersed in other types of mallee. It consists of single trees about 6 or 7 inches or more in diameter and from 12 to 20 feet or more in height. It is not considered objectionable, and can be easily handled on account of the stumps being single, and therefore not too bulky. When very thick it may need some nicking. The soil is usually excellent where this is found.

Broombush.—This consists of a number of fine-stemmed, narrow leaved bushes coming from the same root clump. It does not grow to any great height, and is usually about 4 or 6 feet high. It occurs on different types of soil, but usually it is found on very poor soil that generally takes longer to sweeten up under cultivation. It is considered that broombush grows on the poorest class of mallee soil, and although it sometimes is found to grow good wheat, generally speaking the land is of little use for wheat-growing. It is easy enough to roll, but it suckers very freely. It needs a few good stubble burns to subdue it. In this class of country a disc plough does good work, and if set at the correct angle will cut most of the bushes out satisfactorily after the first burn. This scrub contains no large stumps (unless mixed with other mallee).

A Tractor-drawn Mallee Roller.

Blue Mallee.—This type grows a little taller than broombush, and is easily recognisable by the distinctive bluish colour of the foliage. It is the mallee now so extensively used for the extraction of eucalyptus. It generally occurs scattered through broombush or other mallee, but may occur by itself. The class of country on which it grows is inferior, being little superior to that on which the broombush grows.

Rolling.

A very different method of clearing is adopted to that used in open forest country. Instead of being cut down the mallee is rolled down with a specially constructed heavy roller. This is the first major operation in preparing the country for crop production. A metal roller such as an old boiler or a log of suitable size may be used. It is necessary to construct the roller with a superstructure, pole and wheel, so that it can be drawn along with the horses or tractor working in the rolled portion while the roller draws over into the standing mallee. The diameter and length of

the roller is best decided by the class of mallee to be rolled. It should not as a rule be longer than 10 feet and a team of eight horses is sufficient to draw it.

One of the secrets of successful mallee rolling is to have a sufficient number of horses hitched to the roller so that they can walk along freely with only a slight pull. For example, if the width of the roller and the class of mallee is such that six horses could do the job, then a team of eight should be put in, so that the animals may have an easier task. If this is done there should be no accidents, and the faster pace will save a considerable amount of time. In this hazardous work horses should never be overloaded, as it is when they are floundering about in heavy going that they get injured.

A log about 2 feet 6 inches in diameter is often used for mallee rolling. Such a roller is more effective in rolling out the stumps by the roots, but is troublesome to work, as it is more inclined to get hung up on strong stumps than is a roller of greater diameter; a large iron roller is, therefore, preferable in some classes of mallee. If a log is to be used, a hollow one should be selected, and also one that is tough, with the grain twisted so that it will not split. If a straight-grained log is chosen it will be split under the heavy work. The stouter the mallee the larger should be the diameter of the roller. For big mallee an old boiler 4 feet or so in diameter makes the best roller. For whipstick, broombush or blue mallee the log roller is the better.

It is usual to cut a track along the edge of the area to be rolled to provide a clear path for the horses to travel along. Rolling mallee is an exacting undertaking and requires a certain skill in the driver and steadiness in the horses which only come from experience.

When inexperienced men are on the job, men and horses are easily injured. No definite rules can be laid down to guide a settler under all and every situation; it is desirable, therefore, that only those men should undertake it who have had either some experience of mallee country or who are otherwise good bushmen with reliable judgment.

It is necessary to have one man working in front of the roller to nick all trees that would be too thick and tall to roll satisfactorily. If such clumps or large single specimens are not nicked, when the roller strikes them and runs over them, they break off too high up the stem, and then have to be cut down level with the ground after the mallee is burnt, and as the burning toughens the timber the work is then much harder. Trees to be nicked should be cut as low as possible (right at the ground level), and on the side farthest away from the roller. It is advisable to nick anything over 6 inches in diameter, and sometimes if the mallee is dense and occurring in big clumps it may even be advisable to nick trees of even less than 6 inches diameter. Occasionally scattered ironbark trees or other trees of 1 foot or more in diameter and 30 or more feet high occur in mallee. These are sometimes left untouched so as to provide shade for stock later on, and this is a wise practice, as a few such trees left in a paddock are of great value as shade in this hot country.

The roller is intended to roll down all the standing timber, and although many of the trees are snapped off, if the roller is of a size and weight suited to the class of mallee it is being used on, it should roll in such a manner that many whole clumps of roots are levered out of the ground. This rolling out of the stumps is the desired action of the roller, and if it is simply snapping off the trees without rolling the stumps out it is not doing the work correctly. A fairly short heavy roller of no great diameter is most effective; such a roller hits a clump fairly close to the ground and with considerable force, and is therefore effective in bumping stumps and roots out. A larger roller would simply ride freely over many stumps without levering them out.

When to Roll.

Mallee should be rolled at the end of the winter or early spring to get the best results. When the ground is moist the roller has a much greater chance of rolling the clumps of stumps and roots out of the ground. When it is dry there is little chance of bringing about the desired result, the trees tending to break off near the ground. On the other hand if it is rolled too early in the winter although the clumps are levered out well while the soil is moist the rolled timber has to wait too long before burning, consequently most of the leaves have fallen and do not carry the fire so well. As mallee cannot be burned before the 1st March on account of the danger of bush fires it is advisable to roll as late in the winter or spring as possible but before the soil has become dry.

Rolled Mallee.

It is found that August and September are the best months for rolling; in very dry years, July and August would be preferable, but in any case it should be completed before the end of September. The cost of rolling varies, of course, with the class of timber, but at the present time it is in the vicinity of ten to fifteen shillings an acre.

Preparation for the Crop.

After the rolled mallee is burnt in March it is generally advisable to have any stumps which show above ground knocked off with an axe, so that they are level with the ground: if this is not done endless trouble is occasioned by breakages to the farming machinery. This operation costs about five shillings an acre, which may also include picking up the sticks

still remaining after the fire. If the burn has not been as successful as desirable it may cost an additional five shillings an acre for picking up the loose sticks, but after a good burn such expense is not necessary.

As soon as this is done it is advisable to cultivate the land. Opinions differ as to whether it is advisable to plough or only cultivate for the first crop. On some country it is impossible to plough, but the plough does good work on broombush country. Generally speaking, however, it is best not to plough for the first crop but just to use the cultivator to work the surface into condition. Whatever implement is used, it should be set to go shallow. Most new mallee land is too loose for wheat growing and the first aim should be to get the subsurface compacted as quickly as possible. The land may receive one, two or three shallow workings prior to sowing. May is a good month to sow and about 45 to 55 pounds of seed and 56 pounds of superphosphate or more per acre can be applied.

After the crop is sown the suckers may have grown up a little and should be slashed off.

After harvest the stubble is burnt. It is an excellent practice to roll the stubble prior to burning so as to keep the fire near the ground where it will do most good in burning the young mallee suckers. If the stubble is too light to carry a fire it is advisable to burn it with the assistance of a stubble burner (an implement resembling a hay rake). It is most necessary that as good a stubble fire as possible be obtained in order to check sucker growth.

Cropping Systems.

Some difference of opinion exists as to which is the best method to adopt in cropping mallee land. The general practice is to cultivate the land as soon as the rolled mallee has been burnt. On most classes of mallee it is better to use a disc cultivator, springtooth or similar implement rather than a plough. There is no necessity to cultivate again unless rain falls. Should this happen a further working with disc or springtooth cultivator is advisable. Sowing is then carried out with a combine or drill—it is rough work for a combine, and a drill is therefore preferable. It may be necessary to draw light harrows after the drill to cover the seed. If too rough to permit of this, bushes should be dragged instead.

The aim is to get two or three thick stands of stubble as early as possible on new mallee land so that when the straw is fired a severe check will be given to the still-suckering stumps. There are two schools of thought concerning the best method of achieving this end. One favours sowing a crop every year for the first three or four years before fallowing the land. Those who favour this method claim that in this way a stubble burn is obtained each year which effectively checks the growth of suckers, even if the wheat yields resulting from these crops sown on stubble land without fallow are light. It is found in practice, however, that when three or four consecutive crops are grown in this manner without fallowing that the crops get lighter, and actually the stubbles are so thin that they do not burn effectively and are not as potent a factor in killing

suckers as anticipated, as the fires are not hot enough. The second method is to sow the first crop without fallowing, then as soon as the stubble is burnt to plough the land with a mouldboard plough and sow it the following year and continue to sow only on fallowed land for some years. After observation of both systems in practice over extensive areas in different parts of the State, it is thought that the latter is the more satisfactory. The stump-jump mouldboard plough is preferred to the disc in mallee

Mallee Roots Fenced to Exclude

Heaps such as the above provide useful firewood reserves, but should be securely netted, as they afford excellent harbour for rabbits.

Mallee Land Just Prior to Sowing Second Crop.

Note the suckers, which will have to be slashed after the crop is sown.

country, as it is found that more breakages occur with a disc plough. The mouldboard ploughing given in preparation for the second crop is very effective in severely uprooting some of the live stumps and roots, and it is found that many that would otherwise have suckered prolifically are broken off and die; thus this method, although it sounds drastic, considerably minimises suckering. The plough certainly loosens the stumps. If the mallee farmer can do this the first year he is a long way on the road towards preventing suckering. Further, as suggested above, the fact that crops are sown on fallowed land ensures a denser and heavier stubble and consequently a much hotter fire results when it is burnt.

Various modifications of these two systems exist. One successful mallee farmer uses the mouldboard plough to prepare for his first crop, but this is not possible on much of the mallee land in New South Wales. This farmer takes off three crops in succession without fallowing, and boasts that he never has to slash a sucker. He claims that the first ploughing tears out the roots and stumps very effectively and they quickly die. As soon as each crop is stripped he burns the stubble and immediately ploughs the land, thus giving it a short summer fallow.

The First Fallow on Mallee Land.

Note the suckers shooting up again, and also the stumps, etc., that have been uprooted by the plough and cultivator.

Fallowed Mallee Soil Prior to the Third Crop.

Sticks and a few stumps are still in evidence.

A method that has much to recommend it is to sow oats for the first two crops on new mallee land. Oats always provide a heavier stubble than wheat on this class of country, and therefore give a more effective burn. The disadvantage is that oats are not such a good cash crop as wheat, and the new settler cannot always afford to grow them.

Just which system a settler should adopt depends on the class of mallee and the nature of the soil, also on his financial position, but the foregoing information should assist him in his decision.

Sowing.

A seeding of 50 lb. per acre is sufficient for the first crop, and 56 lb. to 84 lb. of superphosphate per acre should be used. The application of superphosphate to new mallee land does not cause the crop to burn off as was once supposed; on the contrary it considerably increases the yield. This class of country responds to heavy dressings of superphosphate far better than much of the heavier country, and on most of the light sandy mallee country a dressing of 132 lb. per acre is most profitable. As the land gets older and in better condition the amount of seed used may also be increased.

On medium-textured mallee soil it is advisable to sow about 1 inch deep or up to 2 inches, but on the very light sandy mallee soils it may be necessary to sow a little deeper for the first crop in order to place the seed on moist soil. On such soil it is preferable not to harrow after sowing, so as to leave the protection of the raised ridges. They prevent excessive blowing of the soil, and also provide a good catchment for rain and materially assist the early growth of the crop. The ridges between the rows of wheat plants reduce the severity of the wind and prevent extreme drying of the root system.

Mallee Land After a Few Years Cultivation.

The soil in this instance is of a light sandy nature, and the surface is too fine to prevent drifting.

Suitable Varieties of Wheat.

On the better class mallee soils, *i.e.*, the medium to heavy loams, varieties such as Yandilla King, Federation and Waratah are very suitable, but on the lighter sandy mallee soils in New South Wales, Currawa has proved to be the heaviest yielding variety, and it can be strongly recommended for such soils. Varieties that grow strongly and produce a good bulk of stubble for burning should be grown during the first few years in order to assist in killing the mallee suckers. That is why Currawa and Yandilla King are so satisfactory on new country. On older mallee land varieties that have given great satisfaction are Currawa for light sandy soils, Federation, Free Gallipoli, Rajah, Yandilla King and Ranee for the medium to heavy soils. This is as far as our New South Wales experience goes at present. It may be of interest to mention the varieties that do well on the mallee soils in

South Australia. On the light sandy soils Sultan, Caliph, Currawa and Canberra do very well. For the new mallee soils Ford is favoured, as it gives a bulky stubble and ensures a good burn.

Cultivation Methods.

New mallee land is generally very loose on the surface and the aim of the settler should be to get the subsurface soil compacted as quickly as possible. It is advisable only to work the land to a shallow depth; even when ploughing the implement should be set to go as shallow as possible (no more than 3 inches). The compaction of the land improves with age and cropping, provided it is always worked shallow for the first few years. Much of the mallee soil in New South Wales, like that in Victoria, is inclined to be of uneven surface and inclined to crack badly, but it is found that with cultivation the surface becomes more even and the cracks disappear as the consolidation improves.

The heavier and more fertile mallee soils may be fallowed and cultivated in the same manner as that recommended for medium red loams or heavy clay loams as the case may be. The light sandy mallee soils, however, require special methods to ensure success. The methods of working mallee soils are discussed in detail in an article on wheat-growing in the south-west and Riverina in the *Agricultural Gazette* of November, 1926.

Fortunately the greater portion of the mallee soils in New South Wales are of medium to heavy texture; even where areas of light sandy red soil occur they are not so light as the worst areas in Victoria and are not so subject to blowing in heavy winds. Some drifting, however, does occur, and it is thought that as larger areas of such mallee country are cleared this disadvantage will increase. Where winds can sweep over large cleared areas of light sandy mallee soils such blowing is to be expected, and settlers in these new areas, especially as they push farther west, should keep this in mind. Wherever possible strips of mallee timber should be left standing as a protection from the winds. In areas where this has not been done it is advisable to plant breakwinds of suitable native trees. The sugar gum is an excellent tree for this purpose.

Sheep on Mallee Farms.

It is advisable to maintain a flock of sheep on a mallee farm as soon as possible. They will be found of tremendous value in grazing the fallows, and assisting to compact the soil, in addition to providing an added source of income. Although in the virgin state mallee lands are quite useless from a grazing point of view, it is found that they improve after clearing in this respect in a really astounding manner.

The cultivation and the superphosphate applied to the wheat crops rapidly improve the grazing qualities of the land, and it is found that quite a satisfactory number of sheep can be maintained on the farm. The fallows and stubble provide very fair grazing for the sheep, and the improvement in the

physical condition of the soil effected by the sheep is remarkable, the tramping of their hooves on the fallows greatly improving the consolidation of the subsurface soil and making possible the development of a firm seed bed.

The Future.

Now that the possibilities of the New South Wales mallee have been realised, it is being tackled in earnest by wheat growers. Although the mallee presents so many peculiar problems, so much success has already been achieved in the areas now being developed that the future appears most bright. Two factors connected with these areas continually attract one's attention. One is the obvious fertility of the better class mallee soils and the other is the remarkable spirit of the settlers. Almost without exception these men and women are enthusiastic regarding the possibilities of their land. They have the necessary courage and optimism to succeed. As pioneers of the present day they set a high standard in achievement.

Manufacture of Home-made or Dairy Butter.

Presuming that cream and a hand churn are available, let the cream ripen in a cool, pure atmosphere until it is slightly sour to the taste. Fill the churn with this cream to a little more than a third of its capacity. The temperature of the cream should be, say, 55 degrees Fah. or lower, if possible. Revolve the churn for a few turns, and then allow the gas to escape by stopping the churn and opening the lid or the air vents. This should be done twice with an interval of time intervening. Revolve the churn or turn the beaters so as to agitate the cream until the glass on the churn shows slight clearing, or, if there is no glass on the churn, until the cream falls away from the sides cleanly. At this stage add cold water, say, 1 pint to each gallon of cream, preferably at a slightly lower temperature than the cream at time of churning. Continue churning until the butter is in a granular form, about the coarseness of small shot. Drain off the buttermilk and add cold water until the butter grains float freely, revolve the churn for a few revolutions, then drain off the washings and repeat this procedure. The water at the second washing should come away clear or with just a very faint milky tinge.

Now take the butter out of the churn and sprinkle it with salt at the rate of about ½ oz. to 1 lb. of butter. If mildly salted butter is desired, add a little less than this amount, and more if a distinct salty flavour is desired. Then work the salt thoroughly through the butter with pats, preferably on a clean wooden surface which has been previously wetted, using a pressing action and without touching the butter with the hands. A small roller worker can be purchased for this purpose. If the butter can be kept cool, it should stand for at least six hours so that the salt may melt thoroughly, when it can be reworked until the salt has been properly distributed and the butter assumes a compact mass. If the butter cannot be kept cool, the working should be finished at once. Care should be taken not to work the butter too much, otherwise it will become greasy. This operation should be carried out in as cool and pure an atmosphere as possible.—L. T. MacInnes, Director of Dairying.

Raising Tobacco Seedlings Under Vita Glass.

The Department of Agriculture co-operated with the Australian Tobacco Investigation in carrying out trials at Bathurst Experiment Farm to test the relative merits of Vita glass and the plain glass as coverings for seed frames used in the raising of tobacco seedlings. Prior to undertaking these experiments, trials carried out at Kew Gardens (England) had demonstrated that frames covered with Vita glass gave earlier germination and stronger plants than in cases where plain glass was used. It was considered likely that these results, if they could be repeated in this country, would have some bearing upon the control of blue mould disease of tobacco.

The trials at Bathurst farm were designed to determine—

1. The actual merits of Vita glass as compared with plain glass for the raising of seedlings, using varying degrees of ventilation.
2. Whether any difference in temperature resulted from the use of the Vita glass.
3. Whether the difference, if any, was caused by direct rays or influenced by convection.
4. Whether the height of the glass above the ground had any effect on the temperature. Results in this section of the trial were not consistent, and are consequently not worth recording.

In connection with (1) a large tobacco seed frame was divided into six compartments—three pairs—one of each pair being covered with Vita glass, and the other with plain glass. The first pair was kept closed, only about a 1-inch opening being allowed on the lower edge for ventilation. The next pair was well ventilated, being opened wide in the cool of the day and left open several inches at other times, while the third pair was open during all but the stormiest weather. Under none of these treatments did Vita glass show to advantage. A moderate amount of ventilation proved best with both types of glass.

To decide whether any difference in temperature resulted from the use of Vita glass, maximum and minimum readings were taken in each of the six compartments during both day and night. The temperature under the Vita glass was found to be definitely higher than under the plain glass, the greatest difference occurring on bright sunny days, while a decided margin also existed on hazy days when the light was fairly bright. On dull, cool days there was very little difference. It was further proved that the high temperatures recorded under both kinds of glass were due to the direct rays of the sun, convection being an almost negligible factor.

Sow Only Pure Seed Wheat.

Unfortunately the value of pure seed is not fully recognised. In the crop competitions which I judged last season only 22 entries out of a total of 183 were eligible to be gazetted as pure seed. When it comes to live stock the farmer sees the necessity of culling out all inferior types and breeding only from the best. The same conditions apply equally to wheat, but as the plants grow closely crowded together the inferior strains are not outstanding. They are, however, responsible for a reduction in the yield.—G. Nicholson, Agricultural Instructor.

The First Wheat in Australia.

G. P. DARNELL-SMITH, D.Sc., F.I.C., F.C.S., Director of the Botanic Gardens, Sydney.

The first efforts at growing wheat, or corn as it was termed by the first settlers, were made on land which now constitutes part of the Sydney Botanic Gardens.

The following extracts from the earliest despatches will indicate how dependent was the infant colony upon food from outside, and how difficult was the clearing of land and the raising of wheat around Sydney Harbour.

GOVERNOR PHILLIP TO LORD SYDNEY.

Sydney Cove, N.S.W.,
Despatch No. 1. 15th May, 1788.

We got into Port Jackson early in the afternoon and had the satisfaction of finding the finest harbour in the world . . . . The different coves were examined with all possible expedition. The necks of land that form the different coves, and near the water for some distance, are in general so rocky that it is surprising that such large trees should find sufficient nourishment, but the soil between the rocks is good, and the summits of the rocks, as well as the whole country round us, with few exceptions, are covered with trees, most of which are so large that the removing them off the ground after they are cut down is the greatest part of the labour . . . . The great labour of clearing the ground will not permit more than eight acres to be sown this year with wheat and barley. At the same time the immense number of ants and field-mice will render our crops very uncertain.

GOVERNOR PHILLIP TO LORD SYDNEY.

Sydney Cove, N.S.W.,
Despatch No. 4. 9th July, 1788.

Your Lordship will excuse my observing a second time that a regular supply of provisions from England will be absolutely necessary for four or five years, as the crop for two years to come cannot be depended on for more than what will be necessary for seed, and what the "Sirius" may procure can only be to breed from.

GOVERNOR PHILLIP TO UNDER SECRETARY NEPEAN.

Private letter. Sydney Cove, 9th July, 1788.

The Lieutenant-Governor has about four acres of land in cultivation. I have from eight to ten in wheat and barley. The officers will be able to raise sufficient to support the little livestock they have, and which is all that can be expected from them. All the corn raised this year and the next will be saved for seed, and if necessity should oblige us to use it, it would only be a few days' support for the colony; and from the rats and other vermin the crops are very uncertain.

GOVERNOR PHILLIP TO LORD SYDNEY.

Sydney Cove, Port Jackson,
Despatch No. 7. 28th September, 1788.

The detachment is now inclosing ground for their gardens, and we have about six acres of wheat, eight of barley, and six acres of other grain, all which, as well as such garden seeds as were not spoiled, promise well, and though the soil is in general of a light sandy nature, it is, I believe, as good as what is

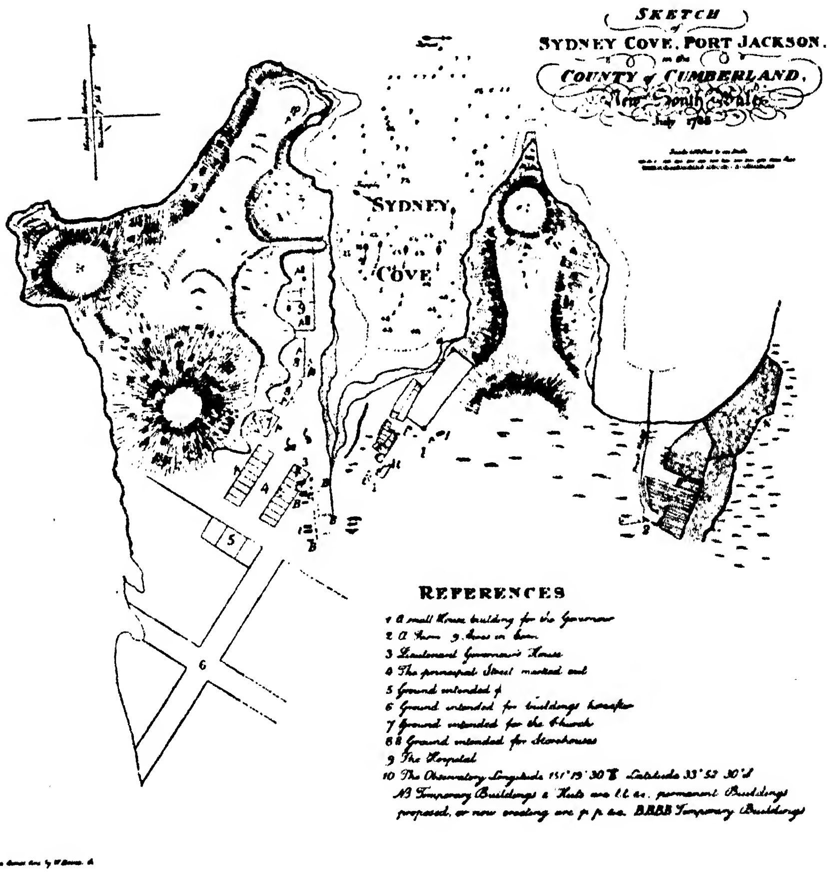
The extracts contained in this article are taken from the "Historical Records of Australia," Vol. 1, Series 1.

commonly found near the sea-coast in other parts of the world. The great inconvenience we find is from the rocks and the labour of clearing away the woods which surround us, and which are mostly gum trees of a very large size, and which are only useful as firewood, though I think that when we can cut them down in the winter and give them time to season they may be made useful in building.

GOVERNOR PHILLIP TO LORD SYDNEY.

Sydney Cove, Port Jackson,
30th October, 1788.

Your Lordship will see by my former letters the little progress we have been able to make in cultivating the lands, and, I presume, the necessity of a few proper persons being sent out to superintend the convicts, as well as settlers, who have been used to cultivation, for at present this settlement affords only one



person that I can employ in cultivating the land in the public account. Most of the officers have cultivated a little ground, but it is merely for their own convenience, and none more than a single acre, except the Lieutenant-Governor, who has about three acres. I have sixteen acres in a small farm in the public account. It must, my Lord, be settlers with the assistance of the convicts, that will put this country in a situation for supporting its inhabitants . . . . .

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Governor Phillip was already looking for more suitable land for growing wheat than that immediately around Sydney Cove. There can be no doubt, however, from a perusal of the extracts from despatches given above as to where the first wheat in Australia was planted.

In a book entitled "The Voyage of Governor Phillip to Botany Bay, with an Account of the Establishment of the Colonies of Port Jackson and Norfolk Island," compiled from authentic papers and published in 1789, there is a map of the settlement and the proposed allocation of land. A reduced copy of this very interesting map, drawn to scale for me by Mr. T. Kerr, is here reproduced. It will be noticed that there was a farm of nine acres set apart for growing corn (*i.e.*, wheat), and through the land flows a stream of fresh water. This farm, from which the name of Farm Cove is derived, now forms part of the Botanic Gardens, and the stream of fresh water still flows through the grounds. Visitors to the Botanic Gardens will easily identify the location.

The following extracts from despatches will indicate the nature of the endeavour that Governor Phillip made to establish wheat in the infant colony.

GOVERNOR PHILLIP TO LORD SYDNEY.

Sydney Cove, Port Jackson,
Despatch No. 11. 16th November, 1788.

I had the honour of informing your Lordship of my intention of fixing a settlement near the head of the harbour, and I have lately passed several days examining the country. The land is good, and though there is none we can take possession of at present which can be cultivated without clearing the ground of the timber—for if the trees are at the distance of thirty or even fifty feet, the roots spread—the labour there, nevertheless, will not exceed the fourth part of what is required in our present situation, and then the land appears to be the best I have seen in this country.

GOVERNOR PHILLIP TO LORD SYDNEY.

Government House, Sydney Cove,
12th February, 1790.

I had the honour of informing your Lordship that a settlement was intended to be made at a place I named Rose Hill. At the head of the harbour there is a creek which at half flood has water for large boats to go three miles up, and one mile higher the water is fresh and the soil is good. A very industrious man whom I brought from England is employed there at present and has under his direction one hundred convicts, who are employed in clearing and cultivating the ground. A barn, granary, and other necessary buildings are erected, and twenty-seven acres in corn promise a good crop. . . .

In December the corn at Rose Hill was got in; the corn was exceeding good. About two hundred bushels of wheat and sixty of barley, with a small quantity of flax, Indian corn (maize) and oats, all which is preserved for seed. Here I beg leave to observe to your Lordship that if settlers are sent out, and the convicts divided among them, this settlement will very shortly maintain itself, but without which the country cannot be cultivated to any advantage. At present I have one person (who has about an hundred convicts under his direction) who is employed in cultivating the ground for the public benefit, and he has returned the quantity of corn abovementioned to the public store.

From these early beginnings we pass to the present position attained by courage, endurance and ingenuity. The output of wheat in the Commonwealth was in 1926-27, 160,852,360 bushels, and it is likely to go on increasing.

The gloomy forebodings of Sir William Crookes have not been fulfilled. At a meeting of the British Association for the Advancement of Science held in Bristol in 1898 (which the writer attended), Sir William Crookes drew attention in his Presidential Address to what he called the Wheat Problem. In the course of his discussion of the facts he produced something like a serious sensation by the statement: "England and all civilised nations stand to-day in deadly peril of not having enough to eat. As mouths multiply, food resources dwindle. Land is limited in quantity, and the land that will grow wheat is absolutely dependent on difficult and capricious natural phenomena."

He predicted that the starvation point would be reached about 1931. The advancement of science has removed that point many years ahead, and with further advances we can face the future without apprehension.

Why We Should Eat More Potatoes.

The ash of the potato is more highly alkaline than that of any other of our common foodstuffs, its ash containing about ten times as much potash as does that of fine flour bread. This fact gives to the potato great importance as a dietetic means of maintaining the alkalinity of the blood and tissue fluids, which modern science has shown to be so important that a loss of alkalinity so great as the difference between ordinary pipe water and distilled water will cause instant death.—Dr. John Harvey Kellogg, in the *American Potato Journal.*

Some Misconceptions Regarding Vegetatively-raised and Seedling Plants.

Two traditions, which do not appear to be founded on established fact, have enhanced the popularity of seedlings as against "layers." It was claimed that all seedlings were deep-rooted, as compared with layers, which were all shallow. Ample evidence has been brought forward to show that shallow-rooted seedlings are as common as deep-rooted ones, and that the progeny of a deep-rooted variety reproduced by vegetative means assumes the same deep-rooted character.

Again, it has been charged against vegetatively-raised plants that they "wear out" owing to the method of reproduction, whereas the sexual method ensures vigour. Wrongly applied methods of vegetative propagation are certainly likely to lead to a weakening of the particular race, but it still remains to be proved that vegetative propagation *per se* has a weakening effect, when root-stocks, such as the Doucin apple which was common in use in Western Europe at least in the seventeenth and eighteenth centuries, still maintain their vigour and efficiency.—From a paper prepared, at the request of the Empire Marketing Board, by the Director of East Malling Fruit Research Station, England.

Field Experiments with Cereal Crops.

Condobolin Experiment Farm, 1928.

G. T. DAWSON, H.D.A., Experimentalist.

THE conditions that existed in this district during 1928 could hardly be regarded as favourable for the production of very good crops, but the results obtained from the experiment area proved conclusively that even under adverse conditions a payable crop can be grown in the Condobolin district, provided the crop is sown at the correct time, and in a properly prepared fallow, and that certain other points in relation to planting are observed.

The extremely wet autumn resulted in the formation of a good moist seed-bed. Sowing was delayed, however, pending the disappearance of the grass-hopper plague. Thus planting was carried out at a date later than is most suitable in this district. When the plots did germinate the young plants were continually eaten back by the inroads of grasshoppers, and the dry winter that followed did not give the plants a chance to recover after their setback.

As is usual in this district, very little rain was recorded in spring, and the windstorms that persisted throughout the months of August, September and October helped to dry out the ground, and make conditions for plant growth anything but good. The rain that did fall in October came too late to be of any material benefit to most of the plots. A violent storm, accompanied by hail, on 14th October, caused much damage among the plots, and another terrific disturbance on 3rd November almost levelled many of the plots to the ground, thus seriously affecting their yields. A comparison between trials stripped before this storm (*e.g.*, the manurial trial), and those harvested afterwards (*e.g.*, the grain variety trials) will clearly demonstrate to what extent the later harvested plots were affected.

The rainfall on the fallow amounted to 1,362 points, and during the growing period was recorded as follows:—May, 52 points; June, 83; July, 166; August, 45; September, 36; October, 138; total rainfall on the growing crop, 520 points. Cultivation of the fallow was the same for all the trials.

The area on which the experiments were carried out was under crop last season, but, owing to the adverse climatic conditions that existed during the growing period, very little growth was made, and sheep were grazed on the land in October and November of 1927. The crop residue left after feeding off was ploughed in to a depth of 4½ inches during December, the soil being in a good condition for ploughing, after the 218 points of rain recorded in November. The phenomenal rains that fell during February caused the whole area to be submerged with water for over a week, and it was not possible

to cultivate the soil till 3rd March, 1928, when the paddock was springtoothed deeply. There was a marked growth of weeds on the fallow after the heavy rains, but the cultivation successfully eradicated them. The paddock was springtoothed again (2 inches deep) on the 10th to 12th of April. This cultivation left the soil in an ideal condition for planting, the seed-bed being well consolidated, moist, and free from weeds.

As a preventive against bunt, all of the wheat seed sown in the experiment plots was dusted with dry copper carbonate, 2 oz. being used per bushel. The efficacy of this treatment is evident from the fact that not a single bunted plant was seen during the year.

The plots each measured one-thirtieth of an acre, and were sown in triplicate.

Early-sown Grain Wheat Trial.

Sowing was delayed till 2nd May on account of the presence of the grasshopper plague. Germination was excellent in all plots except those of Gluyas Early, where a rather poor showing of plants resulted. Seeding in all plots was carried out at the rate of 58 lb. per acre, and high-grade superphosphate was applied at the rate of 60 lb. per acre. These plots were notably free from disease, though Bald Early was infected rather badly with loose smut, and a slight infection of flag smut could be detected among the plots of Union and Hard Federation. Harvesting of the earlier-maturing varieties (Hard Federation, Duri and Gullen) was carried out on 29th October, and the other later maturers were stripped on 6th November. All varieties matured a good sample of well-filled grain in spite of the dry weather conditions.

EARLY-SOWN Grain Wheat Variety Trial.

Varieties in order of merit.	Average yield per acre.		Varieties in order of merit.	Average yield per acre.	
	bus.	lb.		bus.	lb.
Duri	17	10	Bald Early	13	30
Bobin	16	40	Waratah	13	20
Gullen	15	30	Boonoo	13	20
Garra	14	50	Ranee	13	10
Nizam	14	20	Hard Federation	13	0
Union	14	0*	Gidley	11	0†
Gluyas Early	13	30			

* There were two plots only of this variety. † One plot only.

Duri.—The three plots in the trial, although stooling only fairly well, presented a good even appearance. This wheat possesses straw of medium height, which is slender though tough. The grain ripens at the same time as Canberra, and thrashes readily; it is dark yellow in colour. Duri is a wheat eminently suited to dry districts such as Condobolin. The ears are light brown.

Bobin again proved itself well adapted for growth in this district. It stools out well, possesses fairly strong straw of medium height, and ripens with Waratah. The large white grain thrashes readily. A light brown tapering head is characteristic of the variety.

Gullen.—A very early ripening wheat with brown ears, producing translucent grain of good milling quality. This wheat does not thrash readily. The straw is short and fairly strong.

Garra.—A new departmental crossbred, fairly late in maturing, which should do well in this district when sown early. Its straw is fairly strong. The grain thrashes readily, and yields well. The late rain recorded in October greatly increased the ultimate yield of this variety.

Nizam.—A fairly late maturer with short straw and brown awnless ears. This variety would not have yielded nearly so well but for the late October rains. Further tests with it will be necessary before it can be recommended for this district.

Union is a variety that has yielded fairly well over a number of years, but it can hardly be recommended for the Condobolin district when there are other varieties such as Duri and Bobin available.

Waratah did not show up to advantage this year on account of the late sowing necessitated by the presence of the grasshoppers at planting time.

Hard Federation has again proved itself unsuited to this district.

The other varieties tried, with the exception of Bald Early, were all new inclusions in this experiment, and, on this year's results, have proved themselves very disappointing. The results of future trials will determine whether they will be rejected or retained.

Midseason-sown Grain Wheat Trial.

Sowing of the plots in this trial, which was only commenced this year, was delayed till 14th May, pending the disappearance of the grasshoppers. The ideal nature of the seed-bed resulted in an excellent germination throughout; 66 lb. of seed and 60 lb. of high-grade superphosphate were applied per acre.

MIDSEASON-SOWN Grain Wheat Trial.

Varieties in order of merit.	Average yield per acre.		Varieties in order of merit.	Average yield per acre.	
	bus.	lb.		bus.	lb.
Canberra	16	20	Yetna	13	30†
Morven	16	10	Riverina	12	30
Early Bird	14	30	Silver Baart...	11	50
Noongaar	14	0	Goonoo	10	40
Nabawa	13	50	Firbank	10	30
Euston	13	45*	Hurst's No. 9	7	45*

* There were two plots only of these varieties. † One plot only.

The only variety exhibiting any signs of disease was Canberra, which showed a heavy infection of flag smut and a slight infection of foot rot.

Harvesting of the earlier varieties (Noongaar, Riverina, Canberra, Morven, Early Bird, and Firbank) was carried out on 30th October, and of the later varieties (Silver Baart, Goonoo, Nabawa and Yetna) on 5th and 6th November. None of these plots grew to advantage on account of the very late sowing. The necessity of early sowing for grain wheat production in the Condobolin district cannot be too strongly emphasised. A comparison between the yields from the early-sown grain trial and those from the late-sown trial is sufficient proof.

Canberra is a wheat that it is hard to better for the later sowing in this district. Its susceptibility to disease is its only drawback.

Morven was grown for the first time this year, and did very well to yield within 10 lb. per acre of Canberra. This wheat, being fairly disease-resistant, will be worthy of further attention. It stools well and makes dense and even growth, the straw produced being fairly strong, and the flag broad and abundant. Morven thrashes readily, the ears are white, and the grain produced excellent in quality.

Early Bird, although yielding over a bushel less than Morven, is worthy of notice. The variety possesses a rather slender, though strong, straw of medium height. The ears are white. Early Bird ripens very early, and should prove itself suitable for growing in this district.

Noongaar.—A fairly early wheat with light-brown coloured heads. It thrashes readily and produces a good sample of grain. The straw is weak. Dense even growth was made throughout the three plots of this variety.

Nabawa deserves recognition on account of the fact that it is highly resistant to flag smut. Although it has only obtained fifth place in this trial, it would be more payable to grow it in a paddock badly infected with flag smut than a variety such as Canberra, which is highly susceptible to the disease. Nabawa is a fairly late maturer; it possesses strong white straw of medium height, and the ears are white also. The grain is large and easily thrashed.

Euston.—A fairly late-maturing variety, possessing weak straw and producing a nice sample of grain.

Yetna.—A late wheat that has rather weak straw. It does not thrash too readily.

Riverina.—The appearance of this variety during the growing period is very deceptive. Although giving promise of good yields, the amount of grain harvested is invariably low. *Silver Baart* and *Goonoo*, two other new introductions in this trial, did not attain a satisfactory standard of excellence, and *Firbank* and *Hurst's No. 9* again proved themselves unsuitable grain wheats for the Condobolin district.

Grain Oat Variety Trial.

This trial was planted on 1st May, 1928, sowing being carried out at the rate of 49 lb. seed per acre, with 60 lb. of high-grade superphosphate per acre. Germination was good throughout, and the plots made rapid and even growth.

The varieties Palestine and Lachlan were badly infected with loose smut; otherwise the plots were free from disease. Harvesting was delayed pending the arrival of a stripper. The heavy windstorms during September and early October caused much of the ripe grain to shell out. The earlier-maturing varieties, especially Sunrise, Mulga and Buddah, were affected most. On 9th October the plots were cut with a reaper and binder, and stooked in the paddock. They were thrashed from the stooks on 23rd October, with a stationary engine-driven stripper.

GRAIN Oat Variety Trial.

Varieties in order of merit.	Average yield per acre.		Varieties in order of merit.	Average yield per acre.	
	bus.	lb.		bus.	lb.
Palestine	37	10	Buddah	25	10
Mulga	30	0	Sunrise	20	10
Gidgee	28	20	Lachlan	18	20
Belar	27	20			

Palestine proved itself to be easily the best grain oat in the trial. This is an early oat with a very short straw. It makes good even dense growth that is mainly composed of "heads." Palestine is purely a grain oat, and is not suitable for hay growing.

Mulga.—Another early oat. Although not yielding as well as Palestine for grain, it can be regarded as a good dual-purpose grain and hay oat for growing in this district.

Gidgee is somewhat similar to Lachlan, but much earlier maturing. It attains a good height, and matures a fine plump sample of grain.

Belar is rather too late for this district. It makes fairly tall dense growth.

Buddah.—A mid-season oat that makes tall growth, but does not yield satisfactorily enough for recommendation in this district.

Sunrise.—This is an early maturer, but more suitable for silage production in this district.

Lachlan is far too late a maturer for the Condobolin district.

The question of oat growing for profit in this district presents itself. When it is considered that the best yielding wheat in the variety trials (Duri) yielded 17 bus. 10 lb. per acre, and the best oat 37 bus. 10 lb. per acre, it appears that oat growing would pay better, even if only half the price per bushel were obtained for the oats.

The advisability of growing oats in rotation with wheat is apparent. A crop of oats will improve the fertility of the soil and enhance the growth and resultant yield of the succeeding wheat crop. The resistance that oats

offers to certain dreaded fungous diseases (flag smut, foot rot, and take-all) that commonly affect wheat is another argument in its favour, as it helps to starve these diseases out of the soil.

Manurial Trial.

Sowing of this trial, the object of which is to determine the most profitable quantity of superphosphate to apply to the grain crop in this district, took place on 3rd May, 66 lb. of Canberra seed and various quantities of superphosphate being applied per acre. The plots germinated and grew well, although retarded by the constant inroads of grasshoppers. There was a slight infection of loose smut, flag smut and foot rot throughout. Harvesting was carried out on the 25th October, before the heavy storm which damaged the other trials. The grain produced was plump and of good colour and quality. The rain in October came too late to be of any value to the wheat in this experiment.

FERTILISER Trial with Wheat for Grain.

Treatment.	Average yield per acre.		Net return per acre.*			Average yield per acre since 1924.	
	bus.	lb.	£	s.	d.	bus.	lb.
131 lb. of superphosphate per acre	21	20	4	19	8	22	31
110 lb. superphosphate per acre	19	50	4	13	2	23	26
85 lb. superphosphate per acre	19	20	4	12	1	23	16
44 lb. superphosphate per acre	18	20	4	9	4	21	20
67 lb. superphosphate per acre	18	30	4	8	11	21	42
No manure	15	50	3	19	2	16	21

* In arriving at these figures the cost of superphosphate is taken at £6 per ton and wheat is valued at 5s. per bushel.

From the above results it is evident that the use of superphosphate pays, and the most payable dressing is 131 lb. per acre. The fallacy of growing wheat without manure in this district is again clearly demonstrated by the low average yield obtained from the no-manure plots.

Phosphate Fertiliser Trial.

This comprised a trial with high-grade superphosphate, ephos phosphate, and raw rock phosphate. The fertilisers being compared on a basis of the total percentage of phosphoric acid contained in each.

Sowing was carried out on 4th May at the rate of 66 lb. of seed (Canberra) per acre. The plots germinated well, but growth was very adversely affected by the constant attacks of grasshoppers. The wheat never recovered properly after being eaten back, and this accounts mainly for the low yields obtained. There was no disease infection among the plots. Harvesting was completed on the 7th November.

PHOSPHATIC Fertiliser Trial.

Treatment.	Average yield per acre.	
	bus.	lb.
1. High-grade superphosphate, 65 lb. per acre	13	17
2. No manure	10	30
3. Ephos, 54 lb. per acre...	10	2
4. Raw rock phosphate, 37½ lb. per acre	9	50

The benefit, if any, to be obtained from the use of larger amounts of ephos phosphate (84 lb. and 110 lb. per acre) is also being investigated. The following results were obtained :—

Treatment.	Average yield per acre.	
	bus.	lb.
84 lb. Ephos per acre	11	10
110 lb. Ephos per acre	11	40

These results are rather conclusive in themselves. A good dressing of high-grade superphosphate cannot be bettered. Ephos phosphate and raw rock phosphate do not seem to have the same stimulative effect as superphosphate on the young wheat seedlings, the consequence being that the plots treated with ephos and raw rock phosphate never attain the same standard of excellence throughout their growth and yield very poorly in comparison.

It is evident that ephos, if applied at all, cannot be used sparingly if results anything like those obtained from the use of superphosphate are required. Raw rock phosphate cannot be recommended for use with the grain wheat crop under any circumstances.

Combined Rate-of-seeding and Superphosphate Experiment.

The object of this experiment is to discover the best quantity of seed to use per acre, combined with the most payable quantity of superphosphate to apply per acre with that amount of seed, for the production of the grain wheat crop of this district. High grade superphosphate was used throughout. Sowing of this trial took place on 4th May, the various rates of seed and manure being as follows :—

Plot No. 1.—58 lb. seed and 60 lb. superphosphate per acre.
Plot No. 2.—58 lb. seed and 70 lb. superphosphate per acre.
Plot No. 3.—58 lb. seed and 75 lb. superphosphate per acre.
Plot No. 4.—66 lb. seed and 60 lb. superphosphate per acre.
Plot No. 5.—66 lb. seed and 70 lb. superphosphate per acre.
Plot No. 6.—66 lb. seed and 75 lb. superphosphate per acre.
Plot No. 7.—78 lb. seed and 60 lb. superphosphate per acre.
Plot No. 8.—78 lb. seed and 70 lb. superphosphate per acre.
Plot No. 9.—78 lb. seed and 75 lb. superphosphate per acre.

The plots germinated well throughout, and made good growth in spite of the grasshoppers. Flag smut and some loose smut were the only diseases evident. Harvesting was completed on 26th October.

Treatment.	Average yield per acre.		Average yield per acre since 1926.	
	bus.	lb.	bus.	lb.
66 lb. seed, 70 lb. superphosphate per acre ...	19	50	21	10
66 lb. seed, 60 lb. superphosphate per acre ...	19	10	20	5
58 lb. seed, 70 lb. superphosphate per acre ...	18	20	18	55
66 lb. seed, 75 lb. superphosphate per acre ...	18	10	20	5
58 lb. seed, 75 lb. superphosphate per acre ...	18	10	19	5
58 lb. seed, 60 lb. superphosphate per acre ...	17	40	17	50
78 lb. seed, 70 lb. superphosphate per acre ...	17	30	20	15
78 lb. seed, 75 lb. superphosphate per acre ...	17	20	19	55
78 lb. seed, 60 lb. superphosphate per acre ...	17	0	20	15

From the above yields it would appear that 66 lb. seed and 70 lb. high-grade superphosphate is the best combination, but these results cannot be regarded as conclusive, and it will be necessary to obtain yields over a number of diverse seasons before any definite statement can be made as to which is the most profitable application of seed and superphosphate. The plots on which the heavier rates of seeding were applied appeared to grow thicker, though not so tall as those on which the lower rates were applied.

Cowra Experiment Farm.

R. N. MEDLEY, H.D.A., Experimentalist.

Variety trials with wheat for hay and grain conducted during the season just past included many new departmental crossbreds, as well as varieties evolved by selective breeding from selections obtained from farmers' crops and varieties introduced from other States. During the past season the trial was extended to include a hay trial with early-maturing wheats, this having been allowed to lapse for several years. Sowing was in each case made in triplicate in order to obtain uniform results.

The trial was located on a medium-working gray volcanic loam previously cropped to oats during 1926. The oat stubble was grazed and burned, and the land mouldboard ploughed on 27th June, 1927, springtooth cultivated 9th September and 25th October, skim-ploughed 28th November, disc-cultivated 28th December, springtooth cultivated 25th January and 9th February, 1928, disc-cultivated 28th February, springtooth cultivated 13th and 18th April, and for the late-sown sections an extra stroke of the springtooth was given on 10th May. The fallow was stocked with sheep periodically when required.

The Season.

The fallow rainfall was well above the average, but was very unevenly distributed. December being exceptionally dry, followed by a very wet summer, during which the greatest part of the fallow rains were received.

This exceptionally wet period resulted in an extraordinarily heavy weed growth on the fallow, stink grass (*Eragrostis major*) being the most troublesome. The use of tine implements and grazing by sheep proved of no avail in controlling this weed growth, and the only effective means of control was by the use of disc implements, this resulting in too deep working of the fallow which was consequently thrown out of condition. However, the favourable conditions prevailing at planting time hastened the germination and forced the young growth to such an extent that any ill effects that may have resulted from the use of disc implements so late in the season were nullified. Generally the stooling was only fair; in the late-sown sections it was poor. Ideal growing conditions prevailed until September, when a hot dry spell of about two weeks gave the crops a much-needed check, practically all varieties being too forward and growing rankly. Light rain in early October revived the crops, but later in the month frequent light showers accompanied by humid conditions were responsible for a vigorous development of stem rust, which, with the early and rapid ripening, caused considerable "haying in" and pinching of the grain. Generally the ripening of the crops was between two and three weeks earlier than the previous season. The harvested grain, though of particularly good colour, was pinched slightly in practically every variety. In some the pinching was very bad.

Rainfall.

The rainfall during the fallowing period in the case of the early-sown crops was as follows:—July, 1927, 78 points; August, 109; September, 240; October, 263; November, 269; December, 42; January, 1928, 187; February, 141; March, 481; April, 173; total, 2,283 points. In the case of the late-sown crops the registration for April was 264 points, 91 points in May making the total 2,465 points.

The rainfall for the growing period is shown in the following table:—

Month.	Early Sowing.		Late Sowing.	
	Hay.	Grain.	Hay.	Grain.
1928.	Points.	Points.	Points.	Points.
April	91	91	...	...
May	91	91	5	5
June	164	164	164	164
July	270	270	270	270
August	90	90	90	90
September	51	51	51	51
October	170	170	170	170
November	...	105	...	105
Totals	927	1,032	750	855

The most prevalent disease in wheat crops during the past season was rust, which alone was responsible for quite considerable reductions in yield. Leaf rust showed in practically all varieties in August, and during October stem rust developed alarmingly. It can be safely stated that stem rust

alone was responsible for a general reduction in yield by at least 20 per cent., while in varieties showing a heavy infection the yields were reduced by fully 50 per cent. Gidley and Bobin proved the most susceptible to stem rust, while Ford was practically alone in exhibiting an almost total resistance. Burrill, Sultan, and Euston also exhibited resistance, but to a lesser degree than Ford. The prevalence of so much rust is peculiar, as it cannot be said that the conditions usually associated with the spread of rust prevailed for any length of time. During October, when the greatest development occurred, the rainfall was well below the average, but it was received in frequent light showers, after which humid conditions prevailed, this materially aiding the spread and development of the disease.

Next to rust, the disease to cause most concern was foot rot, this disease being found scattered throughout all sections, especially the late-sown ones.

Traces of flag and loose smuts were found, but the infection was not such as to give rise to any great concern. Nabawa again failed to show any infection.

Early Sown Hay Trial.

These plots were sown on 23rd April with 50 lb. seed (graded and dry pickled) and 60 lb. superphosphate per acre. They were harvested on 26th October:—

Variety.	Average Yield of Triplicate Plots, 1928.			Average Yield over two or more years (number in parentheses).		
	t.	c.	q.	t.	c.	q.
Canimbla	2	5	1	3	11	1 (7)
Exquisite	2	3	1	2	10	2 (3)
Turvey	2	3	1	*...........*		
Cadia	2	3	1	...........*		
Zealand	2	0	1	...........*		
Ford	1	16	1	2	1	1 (3)

* Denotes first year of trial.

Late Sown Hay Trial.

Sowing took place on 16th May with 70 lb. seed and 84 lb. superphosphate per acre. The plots were harvested on 26th October. The standard variety is Gresley.

Variety.	Average Yield of Triplicate Plots, 1928.		
	t.	c.	q.
Baroota Wonder	2	8	1
Gresley	2	7	1
Barwang	2	2	2
Waratah	2	1	2

Early Sown Grain Trial.

The plots were sown on 23rd April, at the rate of 50 lb. seed and 60 lb. superphosphate per acre. They were harvested on 4th December. The standard variety in this trial is Yandilla King.

Variety.	Average Yield of Triplicate Plots, 1928.	Average Yield over two or more years (number in parentheses).
	bus. lb.	bus. lb.
Dundee	28 17	.........*
Canimbla	26 9	36 17 (7)
Burrill	26 5	26 5 (3)
Ford	24 38	31 5 (4)
Bredbo	23 7	30 0 (4)
Craboon	22 57	.........*
Sultan	22 49	.........*
Cadia	22 14	33 52 (7)
Dunmore	22 5	.........*
Clarke's	22 2	.........*
Bena	21 48	37 26 (7)
Federation	21 24	.........*
Droophead	20 48	.........*
Elfin	20 9	.........*
Cowan	20 7	.........*
Exquisite	18 33	27 48 (3)
Onas	17 27	34 48 (7)
Duchess	16 59	26 38 (3)
Yandilla King	16 20	24 25 (3)
Gidley	12 7	.........*

* Denotes first year of trial.

Late Sown Grain Trial.

The plots were sown on 18th May with 65 lb. seed and 66 lb. superphosphate per acre, and harvested on 3rd December. Standard variety, Waratah.

Variety.	Average Yield of Triplicate Plots, 1928.	Average Yield over two or more years (number in parentheses.)
	bus. lb.	bus. lb.
Euston	23 15	.........*
Yetna	20 56	.........*
Duri	20 7	31 56 (6)
Waratah...	19 30	33 3 (7)
Canberra	19 18	21 17 (3)
Nabawa	18 42	24 35 (2)
Cookapoi	18 17	19 19 (2)
Hard Federation	17 33	30 24 (7)
Bogan	17 19	15 14 (2)
Ranee	17 8	.........*
Girral	15 56	.........*
Bald Early	15 52	25 23 (3)
Garra	14 58	.........*
Bobin	12 58	29 21 (6)

* Denotes first year of trial.

Notes on the Varieties.

Yandilla King.—The standard variety of the early-sown trials. Yielded poorly in the grain trial, stooled badly, and showed a heavy stem rust infection. Difficult to thresh, this fault being accentuated by the pinched grain. Possesses a serious rival for position in Canimbla.

Canimbla.—Next to Bena, is the most consistent yielder in the early grain section, and heavy hay yielder. It is a serious rival to Yandilla King, which variety it outyields consistently in trials at this farm. It is of the same season as Yandilla King, but is more easily threshed; it is short strawed, with erect, medium-sized, brown, tip-awned heads. Is worthy of extensive district trials.

Dundee.—The most promising of the varieties included in grain trials last season for the first time. This variety is a few days earlier than Bena and is of medium height, with erect, brown, slightly tip-awned heads. Stem rust was present, but did not greatly affect the grain, which was plump and well filled.

Burrill.—This is a promising dual-purpose type, tall strawed, hardy, showing some degree of resistance to rust; heads long, tapering, white and tip-awned.

Ford.—This is proving a very satisfactory dual-purpose variety, showing an almost total resistance to stem rust. It is tall-strawed with semi-erect, tapering, tip-awned white heads. The grain was well filled and of good colour.

Bredbo.—Similar in many respects to Bena, but is less disease-resistant and the head is smaller. Outyielded Bena in spite of the presence of flag smut. There was less stem rust than in Bena.

Craboon.—A little later than Yandilla King, fairly tall with long white, tapering, slightly tip-awned heads. Infection with stem rust was fairly heavy.

Sultan.—This variety is of Waratah class and should have been included in the late-sown section. It is a tall-strawed variety, with fairly long, well-filled, slightly tapering, white tip-awned heads, difficult to thresh. Infection with stem rust was very light. Is worthy of further trial.

Cadia.—A late-maturing dual-purpose variety, ripening too late for local conditions, suited to later districts. Infection with stem rust fairly heavy, as also was flag smut infection.

Dunmore.—A late-maturing variety with short straw, erect, short, tip-awned brown heads. This variety is somewhat on the late side for local conditions, heading out four days later than Yandilla King. Stem rust infection fairly heavy; flag smut prevalent.

Clarke's.—Matures a few days in advance of Bena. Possesses purple straw, light brown, fairly long, well-filled, slightly drooping tip-awned heads. Infection with stem rust slight; traces of flag smut.

Bena.—Over a period of seven years the heaviest yielding variety included in variety trials at this farm. During the past season fell a good way short of expectations, chiefly owing to the effects of stem rust, with which the crop was heavily infected.

Federation.—Included in the variety trials for the first time since 1919. Promised well early in the season, but yield was reduced considerably by stem rust.

Droophead.—This is a mid-seasoned variety with brown, tapering, tip-awned, and (as the name implies) drooping heads. Does not yield as well as it appears.

Duri.—This is the most promising and consistent yielder of the new departmental crossbreds. It is of similar season to Canberra, which variety it resembles in many respects, but it is more disease-resistant, slightly shorter strawed, and a consistently better yielder under local conditions. Heads are of medium length, brown and tip-awned. Infection with stem rust was slight.

Canberra.—Although still popular, now possesses a very serious rival in Duri. Canberra showed traces of loose smut and slight infection of stem rust.

Nabawa.—This variety again exhibited total freedom from flag smut, although the general infection was only light. The stem rust infection was fairly heavy, but in spite of this the grain harvested was large and plump. It is a sparse stooling variety.

Cookapoi.—This variety does not exhibit any outstanding promise after two seasons' trial. It is a sparse stooler with brown, tip-awned erect heads, showing fairly heavy infection of stem rust.

Hard Federation.—This variety is gradually being replaced by better yielding varieties. Showed a fairly heavy stem rust infection, in spite of which the grain harvested was only very slightly pinched.

Bogan.—This variety is about four days earlier than Waratah, and in some respects resembles that variety. Does not show any great promise.

Ranee.—An early-maturing variety of Waratah class; short, stout straw, with small, brown, erect, tip-awned heads. Infection with stem rust fairly heavy.

Girral.—Promised well in early stages of growth, but did not yield up to expectations, showing marked susceptibility to stem rust. The straw is of medium height, stooling fairly well, with brown, semi-drooping, tip-awned heads.

Bald Early.—A heavy stem rust infection and "haying in" were responsible for the failure of this variety, which had given great promise during the previous two seasons.

Garra.—An early-maturing variety with long brown, tip-awned heads, very susceptible to stem rust.

Bobin.—This variety had given distinct promise for a number of seasons, but failed during the past season owing to the effects of stem rust and "haying in," the grain being very badly pinched.

Elfin.—A late-maturing variety heading several days later than Yandilla King; rather late for local requirements. A good stooling variety of medium height with short, tapering white heads; showed a heavy stem rust infection.

Cowan.—Heads out three days later than Yandilla King; showed a heavy infection of stem rust. Heads white, slender, semi-erect. Too late for local conditions.

Exquisite.—This variety failed to maintain the promise of the previous two seasons, yielding poorly in the grain trial. The grain was very badly pinched on account of the effects of stem rust; difficult to thresh. Canimbla is a more formidable rival to Yandilla King than this variety.

Onas.—Also performed badly during the past season, showing a very heavy stem rust infection.

Duchess.—This variety failed to attain the success expected after its performances of previous seasons, owing chiefly to the effects of stem rust; the grain was badly pinched. Foot rot was fairly prevalent.

Gidley.—This variety showed great promise in the early part of the season, but failed badly. The yield was reduced by fully 50 per cent. owing to stem rust; the grain was badly pinched. It is a brown club-headed variety, showing a tendency towards straw weakness.

Turvey.—An excellent hay wheat, included in the early hay trial for the first time. The straw is purplish in colour, tall and fairly fine.

Zealand.—A late-maturing, tall-growing, fine-strawed variety suited for hay only.

Waratah.—This is a standard variety of the late-sown grain trials. Has yielded consistently well for seven years. Considering the season, yielded fairly satisfactorily. Stem rust infection was fairly heavy.

Euston.—This is a very early-maturing variety, heading over a week before Waratah, with short, plump, light brown erect heads. Matured sufficiently early to escape the effects of stem rust, to which it is somewhat resistant, although susceptible to leaf rust.

Yetna.—Heads out a little later than Waratah, but ripens very slowly. It is a fairly tall variety, with medium long, white, tapering, tip-awned heads. Slightly susceptible to stem rust.

Baroota Wonder.—A very promising and hardy hay variety for late sowing. Withstands harsh conditions well, and produces hay of excellent quality.

Barwang.—Not as hardy as Baroota Wonder, but a good variety for more favoured parts.

Gresley.—Has gone out of favour as a dual-purpose variety on account of poor grain yielding ability, but is a good hay wheat for late sowing.

Farmers' Experiment Plots.

Winter Fodder Trials on Lower North Coast.

J. M. PITT, H.D.A., Senior Agricultural Instructor.

EXPERIMENT plots were located on the following farms during the 1928 season :—

F. Wheeldon, Gladstone, Macleay River.
J. Eakin, Belmore-road, Macleay River.
E. H. Ducat, Temagog, Macleay River.
J. Booth, Temagog, Macleay River.
Pead and Souters, Bachwood, Hastings River.
A. R. Longworth, Ghinni, Lower Manning.
J. P. Mooney, Taree, Lower Manning.
Geo. Levick, Taree Estate, Manning River.
R. Richardson, Mondrook, Manning River.
A. C. McLeod, Tinonee, Manning River.
R. Baynes, Cedar Party, Manning District.
R. M. Short, Cedar Party, Manning District.
G. H. Bakewell, Cedar Party, Manning District.
Geo. A. Patterson, Bulby.
J. J. Milligan, Bulby.
W. H. Crowfoot, Buckets-road, Gloucester District.
Alex Smith & Sons, Bandon Grove, Dungog District.
I. Middlebrook, Bandon Grove, Dungog District.
B. Haggerty, Bandon Grove, Dungog District.
A. Hudson, Bandon Grove, Dungog District.
Bosworth Bros., Fosterton, Dungog District.
A. R. Lean, Fosterton, Dungog District.
— Capararo, Fosterton, Dungog District.
Robt. Lean, Fosterton, Dungog District.
S. Ebbeck, "Mowbray," Vacy, Paterson District.
R. Ebbeck, "Belarog," Vacy, Paterson District.
M. Smith, Bonavista, Paterson District.

While the majority of plots were not as good as in past seasons, a few of the more favourably situated ones were of a high standard.

The Season.

Like the preceding season that of 1928 was most unfavourable. In the first place the heavy rains throughout the late summer and early autumn months hindered farming operations to such an extent that very many plots were sown on land only poorly prepared. Many were sown late and in a few instances, where the land was low-lying, were not sown at all. Dry conditions set in during the winter and, with the exception of a heavy downpour in June, which spoilt many plots, continued throughout the remainder of the season, being broken at isolated centres by more or less useful falls. Much wind from the west also was recorded during the early spring and this of course aided in drying out the fields and caused lodging. It was only on those plots that had been fallowed over the summer, or which were more porous than others—at Temagog, Fosterton, &c., for instance—or where the farmer had an opportunity of working the soil and took that opportunity, that crops were anything like up to the standard.

The Plots.

F. Wheeldon (Lower Macleay).—Loamy soil, cropped for many years. Land ploughed and disced twice after previous maize crop. Sown 19th May. Mulga rusted.

J. Eakin (Lower Macleay).—Heavy loam, ploughed once after maize and left, later disced. Crop flooded in April. Sown end April.

E. H. Ducat (Upper Macleay).—Rich alluvial loam, ploughed after maize, sown first week May.

J. Booth (Upper Macleay)—Previous crop, maize, ploughed once and sown first week May. Alluvial loam. Mulga rusted.

Pead and Souters (Hastings).—Sown on fair maize land, but owing to difficulty in preparing plot (rain intervening) was not sown until July. No yields kept. Not much growth was made.

Sunrise Oats (left) compared with Algerian Oats (right).
Grown on hillside soil on the property of Mr. Robt. Lean, Fosterton.

J. P. Mooney (Manning).—Rich light alluvial soil, ploughed six times. Sown 24th April. Plots made excellent growth up to breaking period and then went off on the lighter soil owing to the drying conditions.

A. R. Longworth (Manning).—Fairly heavy alluvial soil, ploughed once, sown May. Very poor and uneven growth. Not weighed.

R. Richardson (Manning).—Medium to heavy loam, ploughed a number of times after fallow, previous crop winter fodders, sown 6th May.

A. C. McLeod (Manning).—Alluvial loam, ploughed twice after maize, sown 15th May.

Geo. Levick (Manning).—Medium loam, sown to oats previously. Fallowed after ploughing in September and harrowed; ploughed November, harrowed and disc harrowed; ploughed again in February and April, and sown on 12th April. Mulga rusted.

YIELDS of Winter Green Fodder Trials.

	Macleay River.				Manning River.				Cedar Party.			Fosterton.				Bandon Grove.		Paterson.
	J. Eakin.	F. Wheeldon.	E. H. Ducat.	J. Booth.	J. P. Mooney.	A. C. McLeod.	R. Richardson.	Geo. Levick.	R. Baynes.	R. M. Short.	G. H. Bakewell	A. R. Lean.	Bosworth Bros.	Robt. Lean.	— Capararo.	Alex. Smith.	B. Haggerty.	M. Smith.
	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.
Sunrise oats ...	10 0	13 0	17 1	...	...	...	...	...	...	...	Plots too uneven to weigh.	11 0	...	...	...	...	10 0	...
Sunrise oats, Gresley wheat, peas and vetches.	...	11 5	...	...	17 0	18 15	14 0	...	...	...	...	11 15	15 10	...	...	15 0	...	13 11
Sunrise oats, Clarendon wheat, peas and vetches.	...	...	...	...	...	...	...	16 0	...	...	...	10 5	...	...	...	...	...	...
Sunrise oats, peas and vetches ...	14 0	...	...	16 4	...	18 8	...	15 0	...	...	...	...	...	...	...	12 2	...	12 15
Mulga oats ...	...	...	...	...	...	17 12	...	15 0	...	...	...	...	...	...	...	...	...	6 8
Mulga oats, peas and vetches ...	...	10 17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mulga oats, Gresley wheat, peas and vetches.	...	...	15 15	...	...	...	13 10	...	...	...	...	...	15 0	...	...	13 4	...	10 0
Mulga oats and French Grey peas...	...	...	...	15 11	...	...	...	...	...	6 19	...	...	15 0	...	...	11 5	...	9 0
Mulga oats, Florence wheat, peas and vetches.	11 0	...	...	...	...	...	...	...	...	...	...	...	15 0	...	...	...	...	...
Buddah oats...	...	...	...	...	...	...	...	11 0	...	...	...	...	...	...	...	...	...	10 15
Buddah oats and peas ...	...	...	...	15 15	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gidgee oats, Clarendon wheat and peas ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	11 2	...	...
Budgery oats, Gresley wheat, peas and vetches.	...	...	...	...	15 0	...	...	...	...	...	...	...	...	...	...	8 17	...	...
Myall oats, Florence wheat, French Grey peas and vetches.	15 10	...	...	...	...	10 0	11 10	...	...	...	...	...	...	...	...	...	...	...
Myall oats ...	...	...	15 11	15 0	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Reid oats ...	...	10 0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gresley wheat ...	...	...	13 15	...	...	...	...	...	5 0	...	...	...	...	...	...	...	...	...
Florence wheat (no manure) ...	...	...	...	...	...	...	10 0	...	3 0	...	...	...	...	...	...	...	...	...
Florence wheat (2 cwt. superphosphate)...	...	...	...	...	...	...	...	...	4 0	...	...	...	...	...	...	...	...	12 2
Clarendon wheat ...	...	...	...	...	...	...	...	...	...	...	...	10 9	...	4 10	...	...	...	...
Algerian oats ...	...	...	...	...	...	...	...	...	...	...	...	...	...	4 0	...	...	...	...
Sunrise oats (no manure) ...	...	...	...	...	...	...	...	...	4 0	6 15	...	...	...	6 10	...	...	...	...
Sunrise oats (2 cwt. superphosphate) ...	...	...	...	...	...	...	...	...	10 10	7 5	...	...	...	6 0	...	...	...	...
Sunrise oats (1 cwt. superphosphate) ...	...	...	...	...	...	...	...	...	...	...	...	...	...	8 15	...	...	...	...
Cape barley ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	7 0	...	...	...
Pryor barley...	...	...	...	...	...	...	8 0	...	...	...	...	...	...	...	6 0	...	...	...
Skinless barley ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	6 0	...	...	...
Trabut barley ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5 10	...	...	...

R. Baynes (Cedar Party).—Second-class flat creek land, clayey. Previous crop Saccaline in 1926, fallowed. Ploughed last week in November, 1927, and harrowed; ploughed and harrowed in February and again on 1st May, then sown.

R. M. Short (Cedar Party).—Somewhat similar soil to preceding plot. Ploughed, harrowed and disced each way after maize crop last year; harrowed, ploughed and disced twice, the last time being just prior to sowing on 14th April.

G. H. Bakewell (Cedar Party).—Also poorish second-class country, somewhat similar to the above. Sown to oats in 1927. Ploughed three times; 1 cwt. superphosphate per acre applied; planted on the rough; harrowed, rolled and harrowed. Patches typical of this class of country did well, but the plots were too uneven to weigh. At first a flood and then a drought adversely influenced the crop.

G. A. Patterson (Bulby Brush).—Creek flat soil. Ploughed three times after maize, in December, February and again before sowing; harrowed and disc harrowed in between times; sown 15th April. An estimate of the yield placed Sunrise and Gresley at over 28 tons, with the other plots running down to about 16 tons. They were quite the best crops grown in the neighbourhood for many years.

J. J. Milligan (Bulby Brush).—Basaltic country, ploughed early in January, again in February, and at the end of March. Sowings made on 17th April and a little later. The Sunrise plots were very good, yielding approximately 20 tons; a later sowing, however, was not quite so good. These were some of the best crops seen in the district for quite a time.

W. H. Crowfoot (Gloucester).—Heavy river flat soil. Previous crop, Japanese millet. Ploughed twice, March and early April; sown 9th April. This was a grazing trial with black winter rye, Slav rye, and a fast-growing oat, Mulga. The rye made remarkable growth, reaching 2 feet in two months—a dense luxuriant growth. Slav was earlier than the Black Winter, both being ahead of Mulga. The rye was fed off on several occasions and proved a remarkably valuable crop for winter grazing, being better than oats. Algerian has been used considerably by the grower for this purpose, but he now considers that rye is superior in every respect. The fertilised plots (1 and 2 cwt. superphosphate) made better and heavier growth than the unmanured plot. Quite a number of grazings were made until the spring.

Alex. Smith and Sons (Bandon Grove).—Rich alluvial soil. Previous crop winter fodders. Ploughed October, cultivated several times from November till sowing time, 10th April. Fertiliser sown across strip. Budgery and Gidgee were not satisfactory, both taking the rust very badly.

B. Haggerty (Bandon Grove).—Previous crop potatoes; alluvial soil, heavy. Ploughed twice and cultivated three times. Sown early in July with 1 cwt. superphosphate.

Messrs. Middlebrook and A. Hudson (Bandon Grove).—Heavy alluvial soil, ploughed twice, the latter farmer's crop being ploughed in. Heavy rain immediately following sowing spoilt germination and the crops did not recover.

Bosworth Bros. (Fosterton).—Medium heavy river flat soil. Previous crop, winter fodders. Disc harrowed in January; double disced, rolled and peg toothed; disc harrowed in February and March; mouldboard ploughed after heavy rain in April, and sown on 27th April; afterwards springtoothed and harrowed. Peas and vetches sown with the maize, being dropped every 2 feet 3 inches throughout the crop. Fertiliser (bonedust and superphosphate) applied at the rate of 194 lb. per acre.

Slav Rye. **Mulga Oats.**

Taken two months after planting on Mr. W. H. Crowfoot's farm at Gloucester. Compare the growth of the rye with that of Mulga oats, which is considered to be a quick grower.

A. R. Lean (Fosterton).—Medium river flat soil. Previous crop oats in 1926, fallow in 1927, ploughed September, disc harrowed December and cross ploughed end of January. Disc harrowed second week February and end of March, ploughed 17th April, harrowed after rain on 23rd April, and sown on 24th April. Superphosphate (½ bag) and sulphate of ammonia (½ bag) applied a week before sowing.

Robert Lean (Fosterton).—Poorish third-class ridge land. Broken up first week in December, second ploughing in January and third in April; harrowed; sown on 3rd May. As usual on this class of soil and when the rainfall is excessive, the plots were patchy.

Lean Bros. (Fosterton).—Medium river flat soil, sown to maize and harvested in May. Heavy crop of weeds; disc harrowed four times in middle of May; disc ploughed end of May when on the wet side; harrowed; planted 2nd June; harrowed and rolled. Manured with superphosphate, sulphate of ammonia, and sulphate of potash. A very late sowing was made and the crop was fed off.

— *Capararo* (Fosterton).—River flat land, heavy. Fallowed twelve months. Summer grass, 6 feet high, ploughed under in January, and again ploughed twice before sowing on 28th April.

S. and R. Ebbeck (Vacy).—Loamy river flat soil, previous crop cow corn. Ploughed twice and well worked with harrow. Sown 24th April. The plots suffered first from too much moisture and then from dry conditions, which stunted the growth on the lighter soil. Plots not weighed.

M. Smith (Paterson).—Previous crop potatoes. Ploughed once and the seed harrowed in; rolled after the crop was up. Sown 1st May.

Remarks.

Sunrise is still the most popular oat, either alone or in combination with other crops.

Mulga, although in most cases very little behind Sunrise in yield, was very susceptible to rust. Myall is also recommended. Buddah, too, showed distinct promise, yielding well and giving a good class of fodder, and coming in about a fortnight earlier than Sunrise, which variety it may in time supercede.

Gresley, when sown alone, was a better wheat than Florence, and Canberra showed promise, especially in combination with Buddah.

The season's results showed that half wheat and half oats in the combination plots did not make a good mixture, there being too much of the wheat, which decreased the yield. Possibly 1½ bushel of oats to every ½ bushel of wheat would be more desirable. Gresley is the best wheat for the mixed plots.

Peas and vetches are still recommended. Owing to unfavourable conditions, they faded out of the mixed plots towards the latter end of the growing period after making a good start. They did better where the stand was thinner, but the yield was not there. French Grey field peas are to be recommended before the old Grey variety, being earlier and a more upright grower. Some farmers follow the idea of sowing the vetches and peas in a different plot to the cereals and mixing when cutting for feed. This is rather a good idea because it ensures a good crop of legumes, which is not always obtained when the cereals grow rank and luxuriant.

Superphosphate at the rate of 1 to 2 cwt. per acre is indispensable, and a little sulphate of ammonia or nitrate of soda gives good results.

Consult the Local Stock Inspector.

Mr. Max Henry, Chief Veterinary Surgeon of the Department of Agriculture, wishes it to be pointed out that any stock-owner seeking the assistance of the Department in connection with disease in his stock should apply in the first instance to the local Stock Inspector, who, if needs be, can readily get in touch with the veterinary staff.

Farmers' Experiment Plots.

Trials with Early Potatoes, 1928.

J. DOUGLASS, H.D.A., H.D.D., Agricultural Instructor.

THE coastal districts between the Hunter and the upper reaches of the Hawkesbury experienced the driest spring on record last year. No useful rains fell after July, hence any potatoes produced were grown either by irrigation or conserved soil moisture. As was to be expected, the crops generally speaking were a failure. In a few localities where irrigation was practised excellent crops were lifted. Perhaps the experiences of this past season will make farmers realise that early deep ploughing with good fallowing methods is the only way in which to grow potatoes with any degree of certainty.

The Hunter River Trials.

Manurial and variety trials were conducted in co-operation with Mr. N. Porter, Hinton, and Mr. S. O. Masters, Raworth. Both these farmers practised deep early ploughing, followed by good fallow cultivation and as a result harvested increased yields. Mr. Masters' fallow was more or less spoiled by the July floods which left a heavy deposit of silt and organic material. This material is the best of soil renovators, but gives best results after it has been weathered and worked down.

The results of the trials are good considering the weather, and again clearly indicate that the Factor potato has come to stay. Not only are heavier yields obtained, but buyers on the Hunter are now beginning to recognise its superior culinary qualities. Mr. Porter reports that his commercial crop of Factors turned out exceptionally well considering the season. The Early Manistee proved to be a very good variety and is worthy of further trial in this district.

The manurial trials at Raworth again illustrated that the use of superphosphate at the rate of 2¼ cwt. per acre is the best paying fertiliser to use. Although only showing an increase of 4½ cwt. per acre on the year's results, it should be remembered that the crop was sold at £15 per ton, the net increased return working out at approximately £2 12s. 6d. per acre.

The Hawkesbury River Trials.

Manurial and variety trials were conducted at Pitt Town Bottom in co-operation with Messrs. May Bros. The season on this river was just as bad as in other districts. The crop, generally speaking, germinated very badly, and the consistent dry westerly winds right throughout the growing period kept the crop back. Owing to the patchy germination true comparisons could not be made. However, from observation it was clear that Factor

potato is the most suitable variety for the district and will come into general cultivation. As a matter of fact these experimenters have definitely decided to plant a commercial area with this variety for the coming season.

RESULTS of Early Potato Trials.

	S. O. Masters (Raworth).			N. Porter (Hinton).			E. Buckland (Miranda).			Moncur Bros. (Campsie).		
Factor—	t.	c.	q.	t.	c.	q.	t.	c.	q.	t.	c.	q.
No manure	3	6	2	2	10	2	7	16	1	5	12	0
Superphosphate (2½ cwt.) ...	3	10	3	2	10	1	7	10	0	6	19	2
Early Manistee—												
No manure	2	9	1	1	15	0	4	19	0	8	3	3
Superphosphate (2½ cwt.) ...	2	12	3	1	16	0	5	0	0	8	6	3
Satisfaction (Howard's)—												
No manure	2	12	1	1	1	0	4	17	2	4	4	3
Superphosphate (2½ cwt.) ...	2	14	0	1	13	0	5	0	0	4	12	0
Satisfaction (Starr's)—												
No manure	2	6	3	1	7	2		......			......	
Superphosphate (2½ cwt.) ...	2	8	3	1	8	2		......			......	
Gold Coin—												
No manure	1	17	1	1	13	0		......			......	
Superphosphate (2½ cwt.) ...	2	7	3	1	11	0		......			......	
Satisfaction (Parson's)—												
No manure	2	2	1	1	8	1		......			......	
Superphosphate (2½ cwt.) ...	2	3	1	1	12	2		......			......	

Trials in the Metropolitan Area.

Small variety trials were conducted in conjunction with the Vegetable Growers' Association, experiments being placed with Messrs. Moncur Bros., Campsie, and E. Buckland, Miranda. Early potatoes are looked upon by vegetable growers around Sydney as one of the surest paying crops.

Very intense cultural methods were practised and excellent results obtained as shown by the yield in the experiments. The soil in most cases is sandy or a medium loam. Abundance of organic material was worked into the soil and irrigation practised. Generally, little artificial manure was used by these growers.

The cost of production in these areas is high. When one considers that land rated by the local council at £250 per acre is being utilised for vegetable growing, and water costs 1s. 3d. per 1,000 gallons, to which must be added other costs not met with in ordinary farming practice, some idea of the high cost of production can be ascertained. These Metropolitan vegetable growers cater for the very early market and also sell direct to retailers. The white skinned potatoes are almost exclusively grown and are called " Kidney " by the trade. The " get-up " of these potatoes for the market would surprise many farmers. The whole crop is washed in two waters, graded, and placed in ½ to 1 cwt. bags. Naturally these potatoes always realise the highest price, as these growers have the advantage of direct marketing.

The main weakness in the growing of Metropolitan potatoes is the bad seed planted. As these growers only purchase small lots of seed they do not go to the trouble of buying direct from a reputable grower. The result is that a good deal of seed of poor quality is planted. Since conducting these trials much interest has been taken in the advantage of planting seed that has been improved by selection by reputable growers. The strain of Factor used in the trials was grown by a prize winner in the Taralga Potato Crop Competition. This strain is undoubtedly the potato for this class of work and the crops surprised many growers who inspected the plots.

TUBERCLE-FREE HERDS.

OF the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number tested.	Expiry date of this Certification.
Department of Education, Hurlstone Agricultural High School ...	38	1 May, 1929
J. F. Chaffey, Glen Innes (Ayrshires) ...	58	2 ,, 1929
F. W. Hopley, Leeton ...	25	14 ,, 1929
P. F. Mooney, Calala ...	33	16 ,, 1929
Department of Education, Gosford Farm Homes ...	16	16 ,, 1929
William Thompson, Masonic School, Baulkham Hills ...	29	23 ,, 1929
Australian Missionary College, Cooranbong ...	57	24 ,, 1929
Lunacy Department, Parramatta Mental Hospital ...	97	6 June, 1929
E. P. Perry, Nundorah, Parkville (Guernseys) ...	26	12 ,, 1929
Dominican Convent, Moss Vale ...	4	26 ,, 1929
Sacred Heart Convent, Bowral ...	10	21 July, 1929
St. Patrick's College, Goulburn ...	8	26 ,, 1929
Presbyterian Ladies' College, Goulburn ...	4	26 ,, 1929
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys) ...	42	9 Aug., 1929
Kyong School, Moss Vale ...	2	21 ,, 1929
Department of Education, Mittagong Farm Homes ...	34	23 ,, 1929
Blessed Chanel's Seminary, Mittagong ...	4	25 ,, 1929
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys) ...	75	25 ,, 1929
Walaroi College, Orange ...	5	30 ,, 1929
Riverstone Meat Co., Riverstone Meat Works, Riverstone ...	127	5 Sept., 1929
J. L. W. Barton, Wallerawang ...	22	11 Oct., 1929
W. McLean, Unanderra ...	41	1 Dec., 1929
Department of Education, Eastwood Home ...	9	5 ,, 1929
Lunacy Department, Morisset Mental Hospital ...	21	7 ,, 1929
J. Davies, Puen Buen, Scone (Jerseys) ...	39	12 ,, 1929
Kinross Bros., Minnamurra, Inverell (Guernseys) ...	73	14 ,, 1929
Lunacy Department, Callan Park Mental Hospital ...	22	19 ,, 1929
Miss Brennan, Arrankamp, Bowral ...	14	20 ,, 1929
E. S. Cameron, Big Plain, Narrandera ...	39	10 Jan., 1930
A. Shaw, Barrington ...	36	11 ,, 1930
Lunacy Department, Rydalmere Mental Hospital ...	68	11 ,, 1930
New England Girls' Grammar School, Armidale ...	22	16 ,, 1930
Lunacy Department, Kenmore Mental Hospital ...	81	28 ,, 1930
G. Miller, Casula ...	15	1 Feb., 1930
A. G. Southwell, Barrack Flat, Queanbeyan ...	25	7 ,, 1930
St. Joseph's Convent, Reynold-street, Goulburn ...	5	19 ,, 1930
St. Michael's Novitiate, Goulburn ...	5	20 ,, 1930
Department of Education, Yanco Agricultural High School ...	32	23 ,, 1930
Tudor House School, Moss Vale ...	8	6 Mar., 1930
Navua Ltd., Grose Wold, via Richmond ...	8	11 April, 1930
St. John's Boys Orphanage, Goulburn ...	9	11 ,, 1930

—MAX HENRY, Chief Veterinary Surgeon.

High Acid Milk and its Remedy.

A. C. SMALL, H.D.D., Senior Dairy Instructor.

ONE of the greatest troubles the cheesemaker has to face in summer months is high acid or "fast" milk. This condition is brought about by an excessive multiplication of certain bacteria which consume that portion of milk known as milk sugar or lactose and convert it into lactic acid. The extent to which lactic acid develops in milk is dependent upon the following factors:—

1. The cleanliness of conditions under which the milk is produced and kept.
2. The temperature at which it is kept.

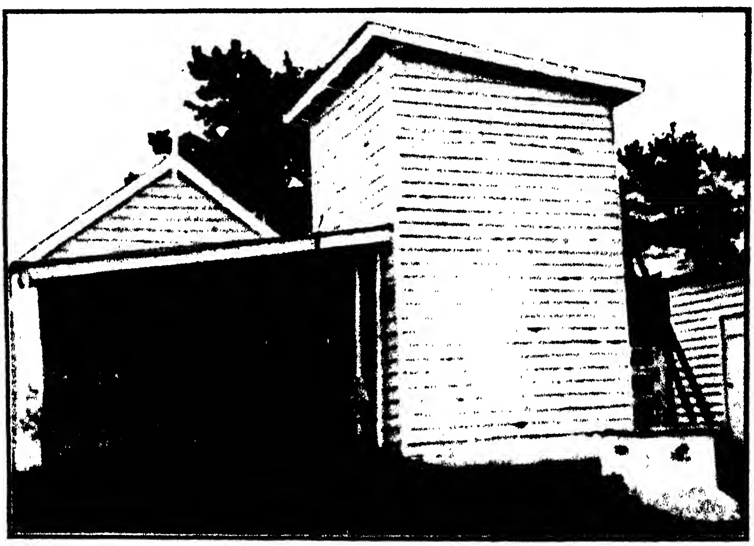


Fig. 1.—A Water Cooling System Installed.

The actual process of cheesemaking begins on the farm with the production of the milk. If the cheesemaker is going to turn out an article of the highest quality and thereby realise for his suppliers the top market rates, a clean milk supply is fundamental.

The practice of partially skimming the night's milk cannot be too strongly condemned, but the losses from this practice are insignificant in comparison with the losses caused by neglect and careless handling of the milk. Milk is practically sterile when first drawn from the udder of a healthy cow, and the number of bacteria present at any subsequent stage is dependent largely upon the extent of contamination with which the milk has come in contact. Milk must be guarded against any condition that will furnish an additional supply of bacteria.

Yards, Bails, etc.—In this respect the yards and bails need daily and careful attention. Any accumulation of dust and dirt should be removed from the cow's udder with a damp cloth, and the milker must keep his hands clean throughout the period of milking.

Utensils.—Perhaps the most prolific cause of bacterial contamination is the use of improperly washed utensils. Vessels used as milk containers should be constructed with smooth, well-tinned surfaces. After use, a thorough washing of all utensils before the surfaces have been allowed to dry is very necessary, for dried milk is difficult to remove. Utensils should be thoroughly scrubbed with tepid water containing a little washing soda, or some other grease-removing compound, and finally scalded with boiling water.

Temperature at which the Milk is Kept.

Milk in its warm condition is more susceptible to contamination than perhaps any other foodstuff. The species of bacteria that inhabit milk will multiply most rapidly at the temperature of milk when first drawn from the cow 90 to 100 degrees Fah. It is therefore, not only essential to produce milk under conditions that will ensure ingress of the smallest number of bacteria, but also to reduce its temperature to as low a point as possible, and thereby prevent further multiplication of germ life and undesirable changes of the milk constituents.

Fig. 2. Milk Receiving Vat Cooler.
Showing the cooler and tray for distributing the milk into the cans after cooling.

A complete system of water cooling on every farm supplying milk for cheesemaking purposes is necessary. Without it, abnormal conditions, particularly in warm weather, must prevail with their resultant heavy losses, not only through the manufacture of an inferior article, but also from losses of the most valuable milk constituents—fat and casein—in the process of manufacture.

To set up an efficient cooling system, a sufficient supply of cool water must be always available. On Kameruka Estate this supply is conserved in large underground tanks. Each dairy on the estate has two storage tanks—one of 3,000 gallons capacity and the other 2,000 gallons.

In the right foreground of Fig. 1 can be seen the top of an underground tank, to the left of which is a semi-rotary hand pump and connections. The tower has been weather-boarded in, and in the top of this is a 400-gallon ship's tank. The water for cooling is pumped up daily by the semi-rotary hand pump into the 400-gallon tank, which is enclosed for protection from the sun. There is a connection from this overhead tank to the cooler through which the water circulates and runs back into the underground tank from where it was originally drawn.

The quantity of water required for efficient cooling is about 3 gallons of water to every gallon of milk to be cooled. The time taken for one man on a Kameruka Estate dairy to pump up 400 gallons of water from the underground tank is approximately twenty minutes.

The temperature of the water in the underground tank rarely rises above 65 degrees Fah., and by regulating a steady flow of milk from the receiving vat over the cooler the temperature of the milk can be reduced to within 2 degrees of the water temperature.

The application of this system of water cooling is being gradually increased, but its general adoption is one of the factors that is urgently needed to produce the desired quality milk for cheesemaking.

Infectious Diseases Reported in March.

The following outbreaks of the more important infectious diseases were reported during the month of March, 1929:—

Anthrax	Nil.
Blackleg	4
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia contagiosa	6
Swine fever	Nil.
Contagious pneumonia	Nil.

—Max Henry, Chief Veterinary Surgeon.

Dairy Science Schools.

During the next six months the Department of Agriculture has arranged to hold a number of dairy science schools throughout the State for the convenience of dairy produce factory employees who are desirous of qualifying as cream graders and milk and cream testers under the Dairy Industry Act. The centres at which the schools are to be held and the dates are as follows:—Byron Bay (27th to 31st May), Casino (17th to 21st June), Grafton (15th to 19th July), Wauchope (29th July to 2nd August), Tamworth (12th to 16th August), Hexham (26th to 30th August), Wagga Wagga (9th to 13th September), Bega (16th to 20th September), Moss Vale (30th September to 4th October).

Applications for attendance or for further particulars should be made to the Under Secretary, Department of Agriculture, Box 36A G.P.O., Sydney, or to the Director of Dairying, 25 O'Connell-street, Sydney.

Black Disease in Sheep.

The Cause of the Disease and how Losses may be Prevented.

GRAHAME EDGAR, B.V.Sc., McGarvie Smith Research Scholar, and
A. L. ROSE, B.V.Sc., District Veterinary Officer.

In an article published in the *Agricultural Gazette of New South Wales* in 1918, the late Dr. Sydney Dodd states: "For about fifty years a disease affecting sheep and resulting in considerable mortality has been known on the southern highlands of New South Wales." In the same article Dr. Dodd states that the first official record of the name "Black Disease" appears in a report submitted by the stock inspector of the Cooma district in 1901. It would appear, therefore, that pastoralists of the southern tablelands had been worried for a great many years by a disease affecting their sheep which was peculiar to that district, and that this disease was what is now commonly known as black disease.

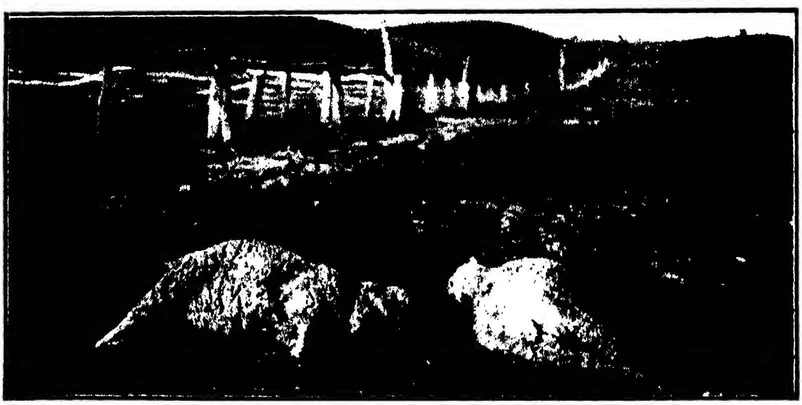
Black disease is the only name applied to the disease in New South Wales, but it seems certain that the same disease occurs in Victoria and Tasmania and is known in those States by the name of "Braxy." In Europe a disease of sheep known as "Braxy" or "Bradshot," is similar to black disease in some respects, but not identical with it.

Where the Disease Occurs.

Black disease is known to occur on the southern tablelands and slopes, and on at least part of the western tablelands and slopes, but is more prevalent in the former. It is not known to occur in any other part of the State. The following districts have been definitely associated with its occurrence:—Bombala, Cooma, Braidwood, Goulburn, Yass, Cootamundra, Gundagai, Tumut, Crookwell, Bathurst, and Carcoar. It must be understood that the disease is not necessarily widespread in the localities above mentioned; it is, however, associated with definite features in the character of the country. Losses from black disease are confined to country well watered by springs, but it is obvious that not all such country harbours the disease, since losses from black disease are unknown on the northern tablelands (New England). The heaviest and most consistent losses from black disease occur on badly-drained country, and in the affected areas one invariably finds springs oozing out of the hillside to form a black waterlogged bog overgrown with water-cress or herbage, or perhaps a slow-moving stream, the course of which is choked with vegetation or interrupted by fallen timber or other features. These conditions predispose to infestation with the liver fluke, and reference will later be made to the close association black disease appears to have with the liver fluke.

It may be mentioned now that black disease is absolutely unknown in the dryer parts of the State where the fluke is not present; it is known also that the presence of fluke in a district does not necessarily mean that black disease may occur there. Moreover, if sheep are taken from black disease country when they are actually dying of the disease and placed on country in a dryer district inland, the disease will not become established there, even though the sheep may continue to die for a period after their arrival.

The oldest reports of black disease come from the Monaro district, where the disease appears to have been established for over sixty years. The earliest evidence we have of the existence of the disease on the western fall of the southern tablelands is its existence there between thirty and thirty-five years ago. The reports on the occurrence of the disease in the districts of Bathurst and Orange are more recent still, and the inference to be drawn is that the disease is spreading gradually. During the last year or two the disease has certainly been found to break out and occasion heavy losses on several properties which have never previously been affected.



Sheep Dead of Black Disease.

Time of Year when Losses Occur.

Losses from black disease are closely associated with seasonal conditions, but as a general rule it may be accepted that the losses may occur between the months of February and May in a normal season. The heaviest losses are experienced in March and April. In the colder districts of higher elevation, such as Cooma and Bombala, losses do occur sometimes in February and March. The intensity of the winter in a particular season usually determines how long through the winter months deaths may continue. It is possible for odd deaths to occur right through the year, but it is most improbable that a heavy loss in the late winter, spring or early summer is due to black disease. Referring again to the association of liver fluke with this disease, we find that the losses from black disease coincide with the season of the year that the young fluke penetrate the liver of the sheep.

Losses from black disease probably occur on affected properties every year, but vary year by year in intensity, some being much worse "black disease years" than others.

The Class of Stock Affected.

Black disease is a disease peculiar to sheep.* No other species of animal become naturally affected. The disease is not transmissable to humans, and there is therefore no risk attached to the handling, skinning or opening of sheep affected with, or which have died of, the disease. This information is included in this article as some owners in the past have feared to have their dead sheep skinned and have thus lost a considerable return in skins carrying good fleeces.

The most constant and remarkable feature coming under the above heading is that sheep which die of black disease are, without exception, either fat or in good forward condition. Sex has no influence on the mortality, ewes and wethers dying with equal frequency, nor does the mortality rate appear to vary in different breeds. The age of sheep is, however, a matter of importance, for it is essentially a disease of grown sheep. Dr. Dodd certainly reports having seen lambs six to twelve weeks old die under circumstances strongly suggestive of black disease, but nevertheless we are convinced that it is extremely rare for lambs or hoggets to die of this disease. Deaths are more frequent in sheep two, three and four years old than, for example, in old ewes. This may be due to the fact that old sheep have acquired an immunity to the disease or that this class is not usually seen in the best condition.

The Extent of Losses.

This factor varies widely in different instances, and it may be accepted that the losses in a given lot of sheep may be only a few odd sheep or may number as many as half the total number. Even the heaviest losses do not occur in a few days, but usually extend over several weeks or two or three months within the seasons indicated above. The following death rates, which have come under our notice, will serve to illustrate this point. In a mob of 2,500 wethers, 1,500 died in two and a half months during 1926; 300 ewes out of a lot of 1,700 died in two months in 1926; 2,500 wethers out of 5,000 died in four months during the 1926 season; while in eight months another owner lost 200 head in a mob of 900 during 1928. Our information would indicate that the mortality rate is usually between 10 and 30 per cent., and in bad black disease years has reached 50 per cent. When sheep are dying on a property it is often found that the deaths are confined to one mob and that the balance of the sheep on the property remain unaffected in spite of the fact that the affected lot are moved from paddock to paddock. This feature may be capable of an explanation later.

* Since writing this article, a case of black disease in a cow has been reported from Victoria by Mr. A. W. Turner.

With such heavy losses occurring in the black disease districts, it can readily be understood that in this disease we have one which must surpass any other disease of sheep in New South Wales from a point of view of economic loss. In 1918 Dr. Dodd considered that half a million pounds was a conservative estimate of the annual loss to the State. With the apparent spread of the disease and the increase of sheep and wool values in recent years, we consider that this figure might safely be doubled.

Up to recent times pastoralists in affected districts have accepted these losses with resignation, being powerless to reduce them materially. The means are now available to reduce these losses substantially, and persistent research may yet reveal a way of entirely eleminating them.

Symptoms.

Death from the disease is so sudden that sheep kept under ordinary paddock conditions are seldom seen showing evidence of illness before death takes place.

The greatest number of deaths occur usually on the camps during the night, the sheep simply being found dead in the morning. Sheep frequently die through the day, however, and if a mob is closely watched an affected sheep may be seen to lag back from the others and perhaps lie down, and unless such a sheep is reached very quickly it will be dead before the observer arrives. Recently when some sheep were being mustered from a paddock one was noticed to hang back, but when approached it rapidly caught up with the others; it was left behind and watched, and for an hour stood or lay about, but made off rapidly if approached. A little over an hour after first being singled out this sheep seemed unable to move much and was easily caught and examined. The body temperature was 104.5 degrees, the respirations were quick and shallow, and the pulse accelerated, which may have been due to exercise. The sheep did not resist being handled, and died quietly while being examined, an hour and a quarter after first showing any evidence of sickness. In most cases sheep do not remain alive as long as this. They invariably die quietly, their attitude suggesting that they have lain down for a rest or sleep.

The question is sometimes raised as to whether sheep ever recover from black disease. The difficulty of satisfying this point lies in the difficulty of securing sheep alive which are actually affected with the disease. Dr. Dodd in his publication suggests that recoveries do occur and gives some evidence in support of his belief. We think that there are a percentage of sheep which become affected and recover, but the point is not of much practical importance. Deaths have been noticed to be more numerous when sheep are being driven or handled to some extent, which rather suggests that some sheep, which might have recovered if left undisturbed in the paddock, have died.

To summarise the position with regard to symptoms, it may be stated that sheep may show evidence of illness a little time before death, but that death is so quick that under ordinary conditions that short period of illness is very seldom observed.

Post-mortem Appearances.

An accurate description of what may be expected to be found in a sheep which has died of black disease is of some importance to those who fear that they may have sheep dying from this cause. In the first place it is necessary to emphasise strongly the fact that a post-mortem examination is of very little value unless it is made immediately after death. The reason for this is that decomposition of the body and organs begins immediately death takes place, and in an hour or two may have so affected the carcase that it becomes difficult to estimate how much of the changes seen were present in the live animal, and how much has been due to the action of the bacteria of decomposition. One often hears of reports made of an examination of an animal that has been dead some time, to the effect that "the body was greatly swollen," "the paunch was full of gas," or that "the lining of the stomach was easily scraped off." Only in rare instances are features such as these found in an animal that has been examined immediately on death. The liver and kidney are often the two most important organs in any post-mortem examination, and owing to putrefactive changes these become so altered as to be of little diagnostic significance.

Skin of Sheep Dead of Black Disease.

Shows blood staining on inside of skin. If animal not recently dead this blood turns very dark, and skin and carcase appear so dark that the name of black disease has been given to the condition.

Bearing these features in mind one proceeds to the examination of the fresh carcase of a case of black disease and the following features will be noticed: Even in a sheep that has been bled, and almost certainly in those that have not, the skin will be found to carry a lot of blood in its vessels. When the skin is hung out to dry the blood congeals and becomes dark in colour, and it was probably this dark appearance on the inside of the skin that suggested the name of "Black Disease."

On proceeding to examine the organs within the abdomen the first impression gained is that they appear normal, with the exception that there may be an excess of fluid within the abdomen. The liver should then be closely examined, and generally it will be found to be a little larger and darker than normal. On its surface may be seen one or several grey areas which vary in size from that of a shilling to half a crown; in some cases, however, these grey areas occupy a large portion of the surface of the liver.

These areas are light or dull grey in colour, and are well defined from the dark red colour of the rest of the liver. If cut with a knife, the greyness will be found to extend into the substance of the liver. As will be seen later, these grey areas are of primary importance in black disease.

The liver also shows evidence of recent invasion by young fluke. Young fluke penetrating the surface of the liver cause a break in its capsule or covering, and at the points of entry the broken capsule appears like small flakes of bran. At these points the actual hole made by the tiny fluke may sometimes be seen, the hole being the size of a pin's head. These points of entry of the fluke are sometimes seen right over one of the grey areas, and if followed up with a knife a very small fluke is sometimes found. Fully grown fluke are seldom seen in a sheep dead of black disease; in fact, only a very few of the small immature ones are present, and these may be easily missed in an ordinary examination, but can almost always be demonstrated in liver sections with the aid of a microscope.

By cutting open the fourth stomach and the first portion of the small bowel the lining wall of these organs is exposed, and if this be scraped clean with a knife one often finds that it is a little inflamed, being deep pink in colour. This appearance is variable, and is not a constant feature. The inflammation is patchy in its distribution, appearing along the folds of the stomach lining, and at the junction of the stomach with the small bowel. It is more regularly seen in the first 8 or 10 feet of the small bowel. No other changes are to be seen in the abdominal cavity, and attention is therefore now directed to the chest.

In opening the chest cavity care should be taken not to interfere with the heart. The sac surrounding the heart normally lies close around the heart, but in black disease it is stretched out under pressure and contains a large quantity of clear straw-coloured fluid. The colour, however, may be somewhat red if the animal has been dead a few hours. This feature is to be found in practically every case of black disease, and it is this presence of fluid in the sac surrounding the heart which, by embarrassing the heart's action, is probably the immediate cause of death.

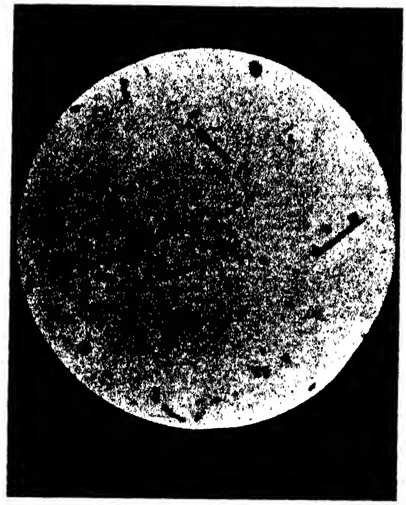
Any one of the features mentioned above may be seen in sheep which have died from other causes, but if the discolouration of the skin, the grey areas in the liver and the distension of the heart sac with fluid are all seen in the same carcase, and the sheep are running on flukey country, then it may be considered that the sheep has died of black disease.

To Distinguish Between Black Disease and some other Diseases.

In the minds of some people black disease is occasionally confused with anthrax. The two diseases have it in common that they both kill sheep very quickly, and in both diseases sheep are seldom seen sick, but are just found dead. Both diseases are prone to occur in definite districts or properties, but the places where outbreaks of anthrax occur in this State are very far removed from the black disease country. In sheep dead of anthrax

there is usually a black tarry discharge from the natural orifices, and on post-mortem one finds the spleen to be enlarged, dark and pulpy, and the blood very dark in appearance and not clotted.

Black disease may easily be confused with acute fluke infestation. Acute fluke infestation is a mass invasion of the sheep's liver with a great number of tiny flukes, the effect of which is to cause comparatively sudden death. Fat sheep are just as likely to die as those in poor condition. There are practically no symptoms or, as in the case of black disease, these are rarely observed. A post-mortem examination, however, shows distinct points of difference. The liver is swollen and mottled, and its surface is pock-marked by a multitude of points of entry of young fluke as previously described. There may be blood or a blood-stained fluid in the abdominal cavity. The young flukes are so small that they may be difficult to detect, but should be situated not far below the surface of the liver. Acute fluke infestation is not commonly seen, but the ordinary or "chronic" type of fluke infestation is well-known, and when sheep are so severely affected as to die they show well-marked symptoms, such as poor condition, "bottle jaw," pale skin, etc., for weeks before dying.



Bacilli which Cause Black Disease.

Black disease might be confused with some of the plant poisonings or dietetic troubles, but these are too numerous and diversified to be discussed here.

Black disease has no connection with blackleg, which is a disease peculiar to cattle.

The Cause of the Disease.

Attempts to discover the cause of the deaths resulting from black disease are recorded as far back as 1895. Dr. Dodd became interested in the disease in 1914, and in 1921 published the results of his researches. Our knowledge of the disease is not yet complete, however, but research recently carried out throws still further light on the condition.

The actual cause of black disease is a germ or microbe which is associated directly with the grey areas in the liver. These areas consist of dead liver tissues, and this accounts for their difference in appearance from the surrounding healthy liver tissue. A microscopical examination of these areas shows numerous microbes of black disease to be present, interposed between the dead and the healthy liver tissue. The particular microbe which is

found in cases of black disease is a rather large bacillus (that is, a rod-shaped germ), and with the aid of the microscope can be readily detected in smears and sections from these areas.

This germ is called *B. oedematiens,* and, as is the case with other bacilli of the same type, it exerts its deadly effect by producing a poison (toxin) during its growth in the liver tissue. So long as that organism is not growing it causes no apparent harm to either the liver or the animal's health generally, as experiments have shown that this microbe may remain in a spore or resting stage in the liver tissue without causing any untoward effect. But immediately an agent, such as the liver fluke, for example, which has a destructive action upon the liver tissue, begins to operate in that organ, suitable conditions are provided for the germination of the spores and the growth of the microbe in the liver.

As soon as this microbe begins to grow and multiply it gives off its poison or toxin, which is carried through the sheep's body in the blood, and by virtue of its deadly nature soon brings about the death of the animal. In considering the post-mortem changes again, we find, therefore, that the grey areas in the liver are caused by the multiplication of the germ in them, while the fluid in the heart sac, the discolouration of the skin and the inflammation in the stomach and bowels are not caused by the germ, but by the poison which it elaborates.

How the Germ Reaches the Liver.

The germ which is responsible for black disease may be found in the upper layers of the soil in districts where black disease is known to occur. It would thus appear that soil is the natural habitat of the germ. This is not unexpected as many disease-producing germs, such as those responsible for blackleg, anthrax, &c., are commonly found as inhabitants of soil in certain districts. As grass often has particles of soil adhering to it, the microbe may be easily taken into the body of a sheep whilst it is grazing, and in all probability it is then carried to the liver by the blood during the process of digestion and absorption of food. It has been shown by experiment that the spore form of this germ can be in the liver, and can remain there for some considerable time without affecting the health of the sheep; moreover, it will probably continue to remain a harmless inhabitant of the liver so long as the liver sustains no injury, such as by the borings of young fluke.

That this occurs is shown by the fact that the microbe is present in the livers of certain percentage of healthy sheep in black disease districts, but it has not been found in the livers of sheep in districts where black disease does not occur.

The Connection of the Liver Fluke with Black Disease.

In an earlier paragraph mention was made of the fact that a close search of the livers of sheep dead of black disease would, in almost every case, reveal the presence of small immature fluke, either in the substance of the liver or just penetrating the covering or capsule of the liver. Most stock-

owners now appreciate the damage which is done to the liver by fluke, but it is not popularly known that young fluke wander about in the liver substance for some time before entering the bile ducts. These wanderings cause considerable destruction of liver tissue resulting in a fair amount of haemorrhage, and it must also be pointed out that a Japanese worker (Shirai) has shown that fluke will bore both into and out of the liver. The liver tissue thus injured provides excellent conditions for the germination and growth of the black disease microbe, and when these conditions are provided this microbe exerts its disease-producing effect. That is, the germ commences to multiply, and as a result of its multiplication elaborates its deadly poison, causing, firstly, the grey areas in the liver and subsequently the death of the sheep. The late Dr. Sydney Dodd was the first to observe the association of black disease with *early* fluke infestation, and the fact that deaths from black disease occur about the time that young fluke are penetrating the liver is now well recognised.

During the late summer and autumn sheep commence to pick up young fluke in the herbage, and it is during this period that black disease makes its appearance. That is, the borings of the young fluke in the liver provide suitable conditions for the multiplication of the black disease germ, which is present in the liver before the sheep became infested with young fluke.

It must, however, be pointed out that although late summer and autumn are the usual periods for fluke infestation and black disease to occur, these periods are governed more or less by the type of season. After a warm spring the two diseases appear earlier, and outbreaks of black disease in late December and January are by no means unknown, and in every case follow an early, warm spring. As a general rule the disease wanes and ceases during the month of May, but in a mild winter deaths may continue until July and August. Stockowners have frequently observed that the duration of black disease is more or less controlled by the advent of frost. With the first heavy frost deaths from black disease usually cease within several days. This has been recently explained by the results of the Japanese worker (Shirai), who found that if young fluke encysted on herbage (as they are before being picked up by sheep) were frozen, they ceased to be infective, in other words they were killed. It is not to be expected that deaths will cease immediately following the first frost and for the following reason. The damage to the liver tissues does not occur necessarily within a day or two of infestation by young fluke. It may be delayed for several days, perhaps a week or two. Thus cases of black disease may not manifest themselves until a corresponding period after the removal of sheep from flukey pastures. However, following the first severe frost, owners should expect deaths from black disease to diminish.

It is thus seen that the sequence of the disease is as follows:—

I.	II.
A. Black disease germ in soil.	A. Young liver fluke in grass.
B. Swallowed by grazing sheep.	B. Swallowed by grazing sheep.
C. Carried to the liver.	C. Penetrates liver of sheep.

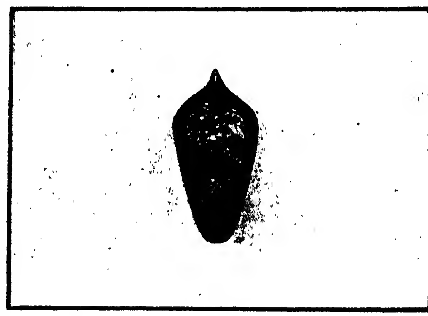
Sheep dies of black disease.

How to Combat Black Disease.

It has been seen that black disease does not exist in the absence of the liver fluke, and that the fluke plays an essential part in assisting the bacillus of black disease to do its deadly work. Theoretically, therefore, if sheep can be prevented from becoming infested with fluke, deaths from black disease will not occur with the exception that in rare instances other agents may possibly cause the necessary destruction of liver tissue; however, at times the young flukes are very hard to detect and might even be overlooked in a careful examination. Losers from black disease are therefore urged to concentrate their energies in an endeavour to reduce the fluke element to an absolute minimum.

The mature, fully-grown, or adult fluke lives in the large bile canals of the sheep's liver. Fluke and the eggs pass out of the sheep's body with the dung. Development takes place within the egg, and on emerging from the egg the young fluke soon dies unless it reaches and bores its way into one

Snail (*Limnaea brazieri*) which Harbours Liver Fluke.
Note the direction of the spiral.



Liver Fluke.
Both illustrations natural size.

particular species of the several kinds of water snail. Further development and multiplication takes place within the snail, and the fluke embryos then leave the snail and become sealed to blades of grass or herbage or remain free in water. In this state they are swallowed by sheep when grazing, and find their way to the liver, to enter it as described previously. The fluke cannot propagate unless it has the opportunity of passing through both the sheep and the water snail. Infestation of sheep with fluke can, therefore, be prevented quite definitely by ridding a property of water snails.

These snails live solely in water and the water must be stagnant or very slow running. The country should be drained when possible, and in addition treated with bluestone, since very weak dilutions of bluestone quickly kill the snails. Experience will indicate how much bluestone is required for the water courses to be treated. One part of bluestone in a million of water will kill the snails, and the evidence of effective treatment is to be seen in the dead snails found after treatment. For the treatment of pools,

streams, &c., the bluestone may be tied in bags and left in the water to dissolve. Bogs and marshes may be treated by broadcasting a mixture of one part of bluestone and three parts of sand at the rate of 1 cwt. per acre. Having regard for the breeding habits of snails and their relation to the fluke we consider that an effort should be made to have the destruction of snails completed before the middle of December. This work should therefore, be carried out during November. The work might profitably be repeated during March of the succeeding year.

The very best of results will follow energetic efforts to kill snails, but, in addition, the treatment of sheep for flukes will also assist. The drug known as carbon tetrachloride (which should be chemically pure) will kill all flukes present in the bile canals in a sheep's liver. That is, it will destroy all full-grown fluke, but its action on the young flukes which are wandering about in the substance of the liver is much less marked. The dose is 1 cubic centimetre. Montgomerie, of Wales, who discovered this line of treatment, used the drug contained in soft gelatine capsules. We prefer Dr. Seddon's modification, consisting of a mixture of 1 cubic centimetre of the drug in 4 cubic centimetres of liquid paraffin. The drug in this form is not only cheaper, but much easier to give than the capsules; it is now readily procurable, but care should be taken to use only preparations put up by reliable firms. The drug is most conveniently given by means of a hypodermic syringe fitted with a bent nozzle instead of a needle. Sheep require no special preparation before treatment. All classes of sheep may be treated, but occasionally a small percentage may die after treatment.

Having regard for the seasonal activity of fluke we consider that sheep should be treated about the middle of March and again towards the end of May. If only one annual treatment is given it should be given towards the end of May.

Summary.

Black disease is a very fatal bacterial disease of sheep. It is very prevalent in some well-defined districts in New South Wales, where it is capable of causing heavy losses.

The disease is intimately associated with the infestation of sheep by the liver fluke, and losses from the disease may be largely controlled by adopting means to prevent sheep from becoming infested with fluke.

We regard the treatment of snail-bearing areas as the most important feature in the control of the disease. This may be achieved by (1) drainage, (2) the use of bluestone in water, and (3) the broadcasting of bluestone on areas incapable of being treated by (1) or (2).

In the prevention of black disease the treatment of sheep for fluke with the drug carbon tetrachloride is a valuable means of assisting in the reduction of fluke on the property. Such treatment alone will not prevent sheep dying of black disease, nor will it reduce the number of deaths in a mob when a mortality is actually occurring.

In conclusion we wish to state that black disease is not included among those diseases which are subject to the Stock Diseases Act of New South Wales. Science has already done much for the stockowner in connection with this disease, and owners will help themselves and the State generally by getting into communication with those interested, in the event of assistance or further information being required.

WRITE FOR FREE PUBLICATIONS.

No matter what your problem, the Department most likely has a free leaflet on the subject. Perhaps you have no immediate problem to solve; then let the Department know the branch of farming you are engaged in, or, better still, write for a copy of the List of Publications, and choose from among those listed therein the ones most useful to your calling.

DELAY MAKES PEST CONTROL DIFFICULT.

HE is an optimist indeed who expects to grow plants or fruit trees without having to contend against pests. It is only by an unending battle—by spraying, fumigating, and dusting, by cleaning and swabbing—that we can get the best results from any crop. Emphasis must be laid on the fact that a pest is far easier dealt with if tackled in its early stages. Pests often increase with great rapidity, so that if left for some days the work of eradication is very difficult.—C. FRENCH, junr., Government Entomologist, Victoria.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1929.

Warialda (C. S. Pyrke)	May	1, 2
Dungog (W. H. Green)	,,	1, 2, 3
Narromine (H. B. Fletcher)	,,	8, 9
Kyogle (D. Campbell)	,,	8, 9
East Gresford (A. R. Brown)	,,	10, 11
Trangie (A. K Butter)	,,	15, 16
Warren (R. D. Stuckey)	,,	23, 24
Forbes Sheep Show (K. O. Anderson)	July	10. 11
Narandera Sheep Show (J. D. Newth)	,,	16, 17
Cootamundra Sheep Show	,,	24, 25
Peak Hill (T. Jackson)	,,	30, 31
Young Sheep Show (T. A. Tester)	,,	31, Aug. 1
Tullamore (A. N. Cornett)	Aug.	7, 8
Trundle (W. P. Forrest)	,,	13, 14
Gilgandra (G. Christie)	,,	13, 14
Illabo	,,	14
Lake Cargelligo	,,	20, 21
Condobolin (J. M. Cooney)	,,	20, 21
Wagga (F. H. Croaker)	,,	20, 21, 22
Junee (G. W. Scrivener)	,,	27, 28
Bogan Gate (J. T. A'Beckett)	,,	28

Ungarie	Aug.	28
Grenfell	,,	27, 28
West Wyalong	Sept.	3, 4
Parkes (L. S. Seaborn)	,,	3, 4
Young (T. A. Tester)	,,	4, 5
Ganmain (C. C. Henderson	,,	10, 11
Forbes (K. O. Anderson)	,,	10, 11
Cowra	,,	10, 11
Barmedman	,,	11
Canowindra	,,	17, 18
Temora	,,	17, 18, 19
Murrumburrah	,,	24, 26
Barellan	,,	25
Boorowa	,,	26, 27
Ardlethan	Oct.	2
Quandialla	,,	2
Narandera (J. D. Newth)	,,	8, 9
Ariah Park	,,	9
Bribbaree	,,	9
Griffith	,,	15, 16
Carcoar	,,	16
Cootamundra	,,	22, 23

Egg-laying Tests at Hawkesbury Agricultural College.

(Under the Supervision of the Poultry Expert.)

TWENTY-SEVENTH YEAR'S RESULTS, 1928-29.

C. E. HOUGHTON, Organising Secretary.

THE twenty-seventh egg-laying competition at Hawkesbury Agricultural College commenced on 1st April, 1928, and terminated on 23rd March, 1929, a period of 357 days. The interval between the 23rd and 31st March makes it possible to remove the birds from the pens and provide for the accommodation of entrants for the next test.

The competition was controlled by a committee of management, comprising four officers of the Department of Agriculture and three competitors' representatives, namely, the College Principal (Mr. E. A. Southee), Messrs. E. Hadlington (Poultry Expert, Department of Agriculture), C. Lawrence (Poultry Instructor, Hawkesbury Agricultural College), C. Judson, W. M. Mulliner, and L. A. Ellis (competitors' representatives), and C. E. Houghton (Department of Agriculture), organising secretary.

Scope of the Competition.

The competition embraced the usual four sections, limited to pullets between seven and twelve months old on 1st April, 1928, and pens were allotted as follows:—

	Groups.	Birds.
Section A.		
Open Light Breeds :—		
White Leghorns ...	55	330
Section B.		
Open Heavy Breeds :—		
Black Orpingtons ..	20	120
Langshans	5	30

	Groups.	Birds.
Section C.		
Standard Light Breeds :—		
White Leghorns ...	4	24
Ancona	1	6
Section D.		
Standard Heavy Breeds :—		
Black Orpingtons ...	1	6
Langshans	1	6
Columbian Wyandottes	2	12
Rhode Island Reds ..	1	6
Totals	90	540

Weight of Eggs.

The regulation that hens must lay eggs at least 2 oz. each in weight, and that eggs from groups must average at least 24 oz. per dozen within four months of the commencement of the test to be eligible for prizes, resulted

in the disqualification of forty individual hens and seven groups, as follows:—

Disqualified from Individual Prizes.

Light Breeds.—R. G. Christie and Son (No. 201), S. E. Daley (Nos. 237, 238, 239), R. B. Dent (No. 244), D. R. Dove (No. 250), J. Every (No. 269), H. Holmes (No. 314), A. Mobbs (Nos. 374, 376), J. Oates (No. 391), P. O. Ranch (No. 401), Southern Cross Poultry Farm (No. 433), H. P. Toop (Nos. 448, 449), Watson and Stepney (No. 457), W. J. Williams (No. 476), F. C. Emery (No. 493), Mrs. M. G. Cummings (No. 500).

Heavy Breeds.—A. W. Bower (No. 5), C. W. Gee (No. 18), W. C. Hardy (No. 24), P. J. Hooker (No. 40), Mrs. J. H. Madrers (No. 46), F. J. Ranken (Nos. 68, 71), A. R. Wheatley (No. 103), T. F. Braithwaite (Nos. 127, 130, 131), W. M. Mulliner (Nos. 512, 515), G. L. Ardill (Nos. 531, 534), F. O. French (Nos. 535, 536, 537, 538, 539, 540).

Disqualified from Group Prizes.

Light Breeds.—S. E. Daley, P. O. Ranch, H. P. Toop.

Heavy Breeds.—F. J. Ranken, T. F. Braithwaite, G. L. Ardill, F. O. French.

The Financial Aspect.

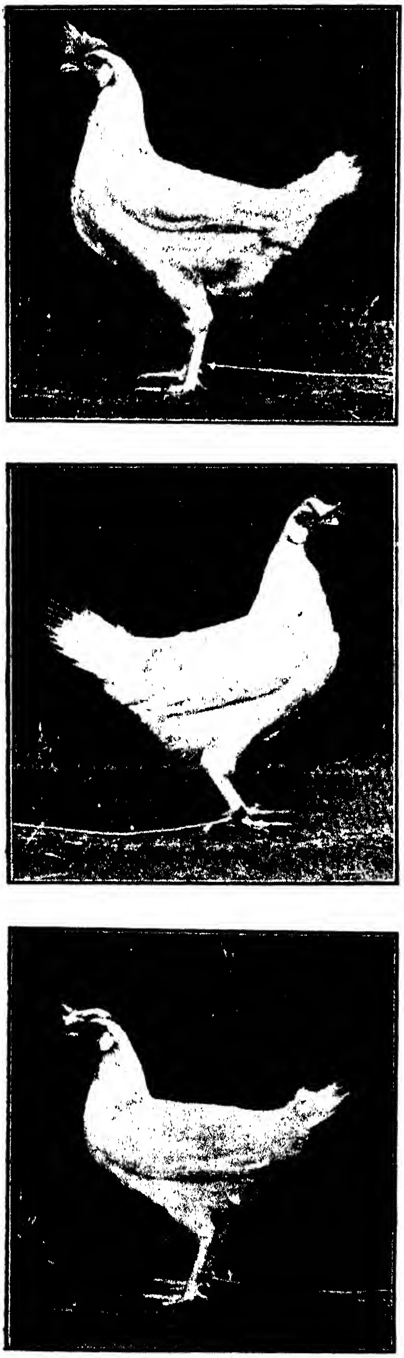
The quantities of feed consumed by the 540 birds were as follows:—

Wheat	325 bushels 58 lb.	Salt	259 lb.
Maize	174 ,, 41 ,,	Shell grit	1 ton 3 cwt.
Pollard	739 ,, 10 ,,	Green feed	90 cwt. 30 lb.
Bran	369 ,, 15 ,,	Epsom salts... ...	51 lb.
Meat meal... ...	13 cwt. 25 ,,		

The total cost of the foodstuffs as purchased by the College was £230 14s. 10d., equal to 8s. 7d. per head. The value of eggs laid in the competition, calculated at Sydney ruling market prices for new laid eggs, was £808 14s. 2d.; the average net price being 1s. 9½d. per dozen.

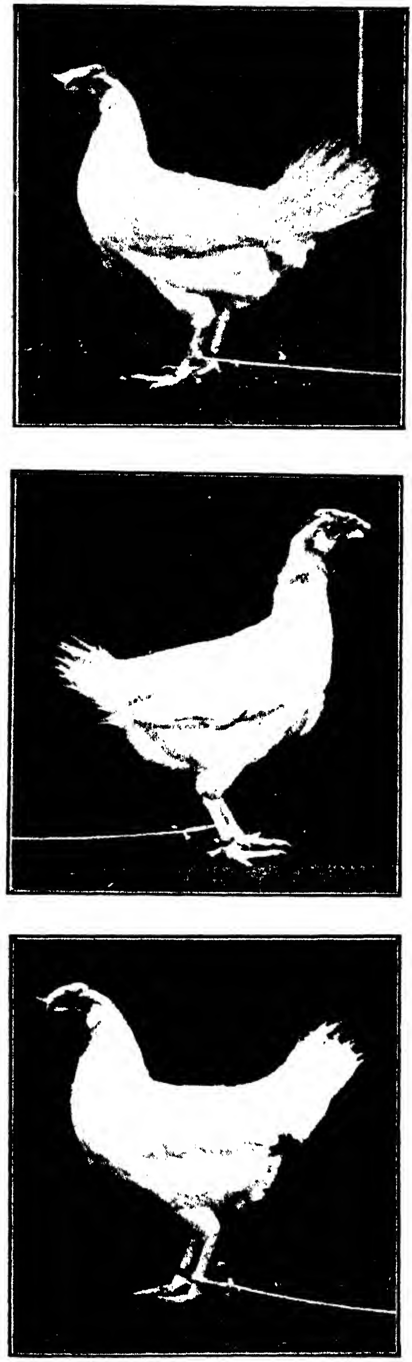
The Monthly Laying.

Month.	Section A. Open Light Breeds.		Section B. Open Heavy Breeds.		Section C. Standard Light Breeds		Section D. Standard Heavy Breeds.		Total.
	Total for 330 hens.	Average per hen.	Total for 150 hens.	Average per hen	Total for 30 hens	Average per hen	Total for 30 hens.	Average per hen.	
April, 1928	3,262	9·9	1,895	12·6	246	8·2	190	6·3	5,593
May, ,,	4,390	13·3	2,393	15·9	352	11·7	285	9·5	7,420
June, ,,	5,291	16·0	2,805	18·7	465	15·5	410	13·6	8,971
July, ,,	6,241	18·9	3,080	20·5	538	18·0	564	18·8	10,423
August, ,,	6,749	20·4	3,578	23·8	581	19·4	616	20·5	11,524
September, ,,	7,216	21·9	3,389	22·6	589	19·6	671	22·4	11,865
October, ,,	7,431	22·5	3,211	21·4	596	20·0	677	22·6	11,915
November, ,,	6,867	20·8	2,544	17·0	536	17·9	491	16·4	10,438
December, ,,	6,616	20·0	2,357	15·7	500	16·6	454	15·1	9,927
January, 1929	5,551	16·8	2,029	13·5	450	15·0	361	12·0	8,391
February, ,,	4,400	13·3	1,796	12·0	313	10·4	339	11·3	6,848
March (1 to 23rd.)	2,628	8·0	1,202	8·0	151	5·0	241	8·0	4,222
Total ...	66,642	201·8	30,279	201·7	5,317	177·3	5,299	176·5	107,537



Three of Mr. T. McDonald's White Leghorns.

Grand Champion Prize for laying eggs of greatest market value (£11 15s. 5d.—1,531 eggs).



Three of Mr. L. A. Ellis's White Leghorns.

Winners of Golden Egg of 1929, awarded by Metropolitan Meat Industry Board.

Averages of Breeds.

No. of Birds.	Breed.	Eggs per Hen.	Weight of eggs per dozen.	Value per Hen.
	Open Light Breeds.		oz.	£ s. d.
330	White Leghorn	200·7	25	1 10 2
	Open Heavy Breeds.			
120	Black Orpington	198·3	25	1 10 4
30	Langshan	215·2	25	1 13 3
	Standard Light Breeds.			
24	White Leghorn	181·9	24¾	1 7 7
6	Ancona	159·6	25½	1 2 3
	Standard Heavy Breeds.			
6	Black Orpington	190 5	24	1 8 11
6	Langshan	209·8	26½	1 11 7
12	Columbian Wyandotte ...	163·2	22½	1 4 0
6	Rhode Island Reds	156·3	27¼	1 1 10

Mortality and Disease.

The casualties due to deaths (fifty-one) and sickness (seven) totalled fifty-eight, as compared with thirty-two in the year previous. Exceptionally dry and hot conditions were experienced during midsummer, the temperatures exceeding 100 degrees on ten days in the month of January.

Particulars of the casualties in the various sections are as follows:—

	1927-28.		1928-29.	
	Light Breeds.	Heavy Breeds.	Light Breeds.	Heavy Breeds
Birds replaced	6	3	16	4
Birds not replaced	11	12	20	18

Weights of Winning Birds.

The following are the weights at the beginning and end of the competition of the birds laying the greatest number of eggs:—

		Weight at April, 1928.		Weight at March, 1929.	
Groups.		lb.	oz.	lb.	oz.
Light Breeds— T. McDonald's White Leghorns, Nos....	355	3	12	3	12
	356	3	12	4	4
	357	3	8	3	12
	358	3	8	3	10
	359	3	8	3	10
	360	3	12	3	2
Heavy Breeds— Mrs. J. H. Madrer's Black Orpingtons, Nos.	43	5	12	6	0
	44	5	12	7	4
	45	5	12	5	8
	46	5	12	5	12
	47	5	0	6	0
	48	5	8	6	4
Individual Hens.					
Light Breeds— Neal Bros.' White Leghorn, No. 382		3	12	4	0
Heavy Breeds— P. F. Miller's Black Orpington, No. 49 ...		5	2	6	4

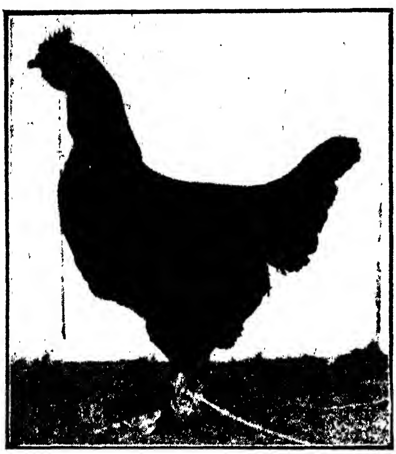
Annual Competition.

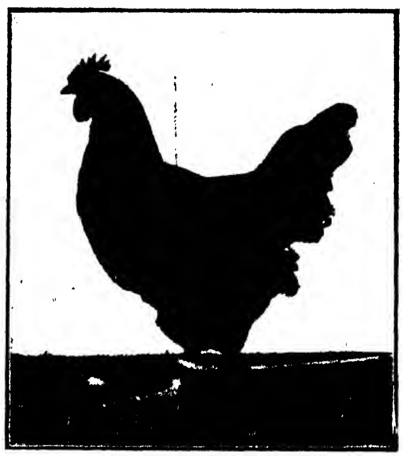
Full details of the financial and other results since the inception of the competition are given in the following comparative table:—

	No. of Groups.	Winning Total.	Lowest Total.	Highest Monthly Total.	Average per Hen.	Average Net Price of Eggs.	Average Value per Hen.	Cost of Feed per Hen.	Balance over Feed.
1st ...	38	1,113	459	137	130	1/1	15/6	6/-	9/6
2nd ...	70	1,308	666	160	163	1/3¾	17/9	5/9¾	12/-
3rd ...	100	1,224	532	154	152	1/-	12/9	4/5½	8/3
4th ...	100	1,411	635	168	166	-/11½	13/3	5/3½	8/-
5th ...	100	1,481	721	162	171	1/0½	14/10	5/10	9/-
6th ...	60	1,474	665	161	173	1/2¼	17/2	7/-	10/2
7th ...	50	1,379	656	159	180	1/3¼	19/2	7/9½	11/4
8th ...	60	1,394	739	158	181	1/5¼	21/9	6/9	15/-
9th ...	40	1,321	658	151	168	1/2	16/3½	6/5½	10/2
10th ...	50	1,389	687	146	184	1/2½	18/5½	6/1½	12/4
11th ...	50	1,461	603	156	178	1/3½	19/4¼	7/3½	12/0¾
12th ...	50	1,360	724	152	177	1/2½	17/7	5/9	11/10
13th ...	63	1,541	705	162	181	1/2	17/8½	6/9½	10/11
14th ...	70	1,449	506	165	192	1/4½	22/2	7/7	14/7
15th A	40	1,526	924	162	216	1/3¾	28/8¾	6/10	16/10¾
15th B	30	1,479	749	165	192	1/3¾	21/7½	6/10	14/9½
16th A	40	1,525	923	157	209	1/4	21/9¾	7/8	14/1¾
16th B	30	1,613	931	170	202	1/4	21/2	7/8	13/6
17th A	40	1,448	860	153	199	1/5½	22/0½	7/10	14/2½
17th B	30	1,517	815	151	189	1/5½	21/11¼	7/10	14/1¼
18th A	30	1,438	988	148	203	1/10	28/10	9/3	19/7
18th B	50	1,428	745	151	190	1/10	28/1	9/3	18/10
18th C1	3	1,304	977	138	195	1/10	27/8	9/3	18/5
18th C2	7	1,336	955	150	191	1/10	28/5	9/3	19/2
19th A	33	1,516	996	167	206	2/2	37/11	12/8	25/3
19th B	47	1,488	955	168	204	2/2	37/11	12/8	25/3
19th C1	5	1,425	944	148	195	2/2	36/-	12/8	23/4
19th C2	5	1,298	1,020	150	193	2/2	35/9	12/8	23/1
20th A	45	1,480	881	157	196	1/11	30/10	11/9	19/1
20th B	35	1,457	696	160	192	1/11	31/2	11/9	19/5
20th C1	5	1,092	885	144	168	1/11	24/7	11/9	12/10
20th C2	5	1,370	1,092	147	197	1/11	33/5	11/9	21/8
21st A	50	1,425	646	164	195	1/9	28/5	10/10	17/7
21st B	30	1,417	720	164	188	1/9	27/5	10/10	16/7
21st C1	5	1,220	864	149	176	1/9	25/8	10/10	14/10
21st C2	5	1,212	931	144	187	1/9	27/3	10/10	16/5
22nd A	50	1,508	942	161	210	1/6	26/3	9/9	16/6
22nd B	30	1,600	871	164	203	1/6	26/3	9/9	16/6
22nd C1	5	1,307	692	142	170	1/6	21/1	9/9	11/4
22nd C2	5	1,430	1,052	152	205	1/6	26/9	9/9	17/-
23rd A	57	1,470	961	160	212	1/8	28/7	9/11	18/8
23rd B	23	1,558	1,006	164	211	1/8	29/2	9/11	19/3
23rd C1	5	1,291	950	146	180	1/8	23/5	9/11	13/6
23rd C2	5	1,308	1,049	159	192	1/8	27/5	9/11	17/6

Annual Competition—*continued.*

		No. of Groups	Winning Total.	Lowest Total.	Highest Monthly Total.	Average per Hen.	Average Net Price of Eggs.	Average Value per Hen.	Cost of Feed per Hen.	Balance over Feed.
24th	A	50	1,444	803	158	206	1/6	26/5	10/-	16/5
	B	30	1,466	916	171	199	1/6	26/4	10/-	16/4
	C1	5	1,248	881	136	187	1/6	25/-	10/-	15/-
	C2	5	1,331	777	151	186	1/6	24/7	10/-	14/7
25th	A	51	1,531	797	162	209	1/8½	29/4	11/-	18/4
	B	29	1,519	753	161	204	1/8½	29/2	11/-	18/2
	C1	5	1,319	1,092	147	173	1/8½	23/8	11/-	12/8
	C2	5	1,326	842	155	203	1/8½	28/9	11/-	17/9
26th	A	50	1,505	885	162	205	1/10	30/9	9/7	21/2
	B	30	1,487	1,005	165	207	1/10	31/11	9/7	22/4
	C	5	1,234	790	138	168	1/10	24/1	9/7	14/6
	C2	5	1,339	1,029	149	192	1/10	30/-	9/7	20/5
27th	A	55	1,531	868	173	201	1/9½	30/2	8/7	21/7
	B	25	1,386	954	163	201	1/9½	30/11	8/7	22/4
	C	5	1,302	914	147	177	1/9½	26/6	8/7	17/11
	D	5	1,259	883	155	176	1/9½	26/1	8/7	17/6





Two of Mr. F. C. Nicholls' Pen of Langshans.
Winners of the Runner-up Cup, donated by the Metropolitan Meat Industry Board.

PRIZE LIST.

GRAND CHAMPION PRIZE (Value £5 5s).

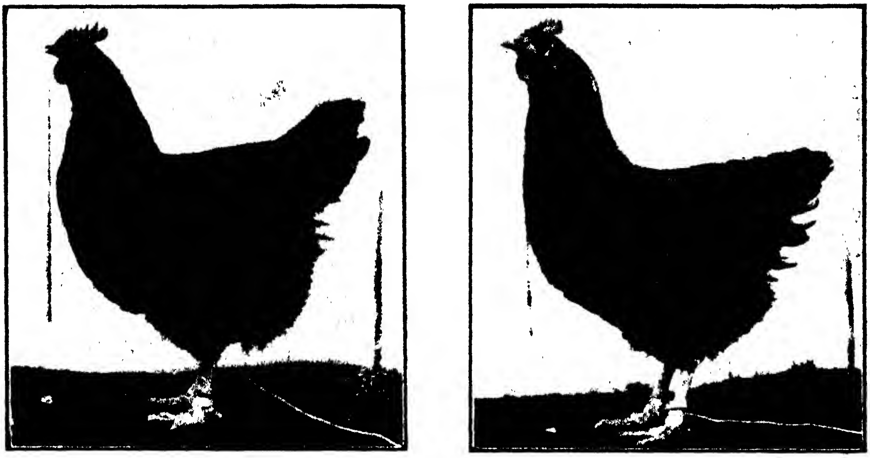
For group of six birds laying eggs of the greatest market value, without replacement of a bird; each bird to lay eggs of prescribed standard of 24 oz. or over per dozen.—Mr. T. McDonald's White Leghorns, market value £11 15s. 5d. (1,531 eggs).

GOLDEN EGG, 1929 (Value £25).

Presented by the Metropolitan Meat Industry Board, for group of six birds; points to be awarded for number, quality, and market value of eggs, also standard quality of the birds.—Mr. L. A. Ellis's White Leghorns, 75½ points.

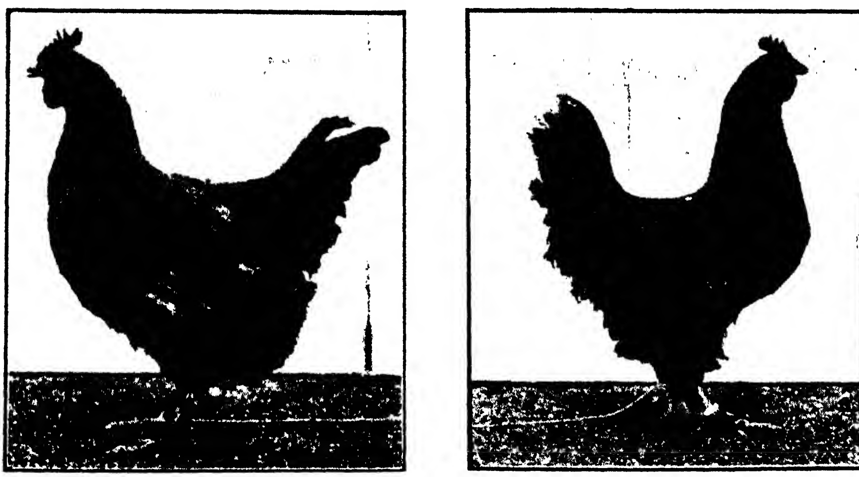
SPECIAL PRIZES.

RUNNER-UP CUP, value £10 10s. (donated by the Metropolitan Meat Industry Board), for the leading group, judged on the same scale of points, in the division opposite to the winner of the Golden Egg, 1929.—Mr. F. C. Nicholls' Langshans, 70$\frac{3}{4}$ points.



Two of Mrs. J. H. Madrers' Pen of Black Orpingtons.

Winners of prizes for greatest number of eggs and highest average in heavy breeds.



Two of Mr. P. A. Barrett's Pen of Langshans.

Winners of the Hadlington Commemoration Medal, donated by Mr. W. H. Paine.

THE HADLINGTON COMMEMORATION MEDAL (donated by Mr. W. H. Paine, Superintendent, Animal Foods Department, Metropolitan Meat Industry Board), for the leading group of six birds completing the competition and laying at least 1,100 eggs of prescribed weight, judged on type and breed characteristics, weight of birds on 1st August, 1928, and weight of eggs.—Mr. P. A. Barrett's Langshans, 75$\frac{1}{2}$ points.

The Judson and Wimbleford Special Prizes, value £3 3s. each (donated by Messrs. C. Judson and Son and F. T. Wimble, for heavy and light breeds respectively), for groups scoring 1,350 eggs or more, on points awarded according to individual laying from 225 eggs, all eggs to be of standard weight, and no entry from the donors to compete.

Heavy Breeds.—No award.

Light Breeds.—T. McDonald (White Leghorns), 15 points.

The Wimbleford Thousand, value £2 2s. first and £1 1s. second (donated by Mr. F. T. Wimble), for the first and second groups of White Leghorns to lay 1,000 eggs of standard weight, no entry from the donor to compete.—T. McDonald, £2 2s., 1st; F. Crisp, £1 1s., 2nd.

The W. M. Mulliner Egg Weight Prize, value £2 2s. (donated by Mr. W. M. Mulliner), for the group laying the greatest number of eggs, with a minimum of 26 oz. and maximum of 28 oz. per dozen for each hen, eggs to be normal in shell, texture, and shape, and no entry from the donor to compete.—Mr. R. M. Smith's Rhode Island Reds. Four birds averaged each 28 oz. per dozen, and two birds each 26 oz. per dozen. Total score, 938 eggs.

The "Poultry" Newspaper, value £2 2s. (donated by *Poultry* newspaper), for the individual hen which first lays 200 eggs of prescribed weight in the competition.—P. F. Miller (Black Orpington, No. 49), 200 eggs in 213 days.

The Producers' Distributing Society's Prize, value £2 2s., for the individual hen which lays the greatest score, without break of a day.—P. F. Miller's Black Orpington, No. 49, 72 eggs on consecutive days.

Quality Prizes (Open Sections).

For highest scores from groups selected for standard points and laying at least 1,200 eggs of prescribed weight.

Heavy Breeds.—F. C. Nicholls (Langshan), 1,342 eggs, £5; L. Richmond (Black Orpington), 1,312 eggs, £2 10s.

Light Breeds.—L. A. Ellis (White Leghorn), 1,418 eggs, £5; N. Rosso (White Leghorn), 1,286 eggs, £2 10s.

Quality Prizes (Standard Sections).

For highest scores from groups in the standard sections, with a minimum of 1,100 eggs of prescribed weight.

Heavy Breeds.—P. A. Barrett (Langshan), 1,259 eggs, £2; no award for second place.

Light Breeds.—J. Cornwell (White Leghorn), 1,232 eggs, £2; no award for second place.

Highest Average Prizes (Groups of Five or Six Birds).

Heavy Breeds.—Mrs. J. H. Madrers (Black Orpington), average 231 eggs, £3; A. R. Wheatley (Black Orpington), average 230 eggs, £2 10s.; F. C. Nicholls (Langshan), average 223.6 eggs, £2; W. W. Tennant (Black Orpington), average 223.5 eggs, £1 10s.

Light Breeds.—T. McDonald (White Leghorn), average 255.2 eggs, £3; F. Crisp (White Leghorn), average 243.8 eggs, £2 10s.; Bide-a-wee Poultry Farm (White Leghorn), average 242.7 eggs, £2; L. A. Ellis (White Leghorn), average 236.3 eggs, £1 10s.

Greatest Number of Eggs (Group of Six Birds).

Heavy Breeds.—Mrs. J. H. Madrers (Black Orpington), 1,386 eggs, £3; F. C. Nicholls (Langshan), 1,342 eggs, £2 10s.; W. W. Tennent (Black Orpington), 1,341 eggs, £2; L. Richmond (Black Orpington), 1,312 eggs, £1 10s.; A. E. Ross (Langshan), 1,304 eggs, £1.

Light Breeds.—T. McDonald (White Leghorn), 1,531 eggs, £3; F. Crisp (White Leghorn), 1,463 eggs, £2 10s.; Bide-a-wee Poultry Farm (White Leghorn), 1,456 eggs, £2; L. A. Ellis (White Leghorn), 1,418 eggs, £1 10s.; W. J. Scarboro (White Leghorn), 1,416 eggs, £1.

HIGHEST INDIVIDUAL SCORES.

Heavy Breeds.—P. F. Miller (Black Orpington), 315 eggs, £2 10s.; A. R. Wheatley (Black Orpington), 296 eggs, £2; Mrs. V. E. Cox (Black Orpington), 282 eggs, £1 10s.; Mrs. V. E. Cox (Black Orpington), 280 eggs, £1.

Light Breeds.—Neal Bros. (White Leghorn), 290 eggs, £2 10s.; T. McDonald (White Leghorn), 286 eggs, £2; T. Buckley (White Leghorn), 280 eggs, £1 10s.; E. F. Goldsmith (White Leghorn), 280 eggs, £1.

QUARTERLY (GROUP) PRIZES.

Winter Test (1st April, 1928, to 30th June, 1928):—

Heavy Breeds.—Mrs. J. H. Madrers (Black Orpington), 417 eggs, £2; F. C. Nicholls (Langshan), 388 eggs, £1 10s.

Light Breeds.—S. E. Daley (White Leghorn), 379 eggs, £2; K. G. Cobcroft (White Leghorn), 339 eggs, £1 10s.

Spring Test (1st July to 30th September, 1928):—

Heavy Breeds.—A. H. Moxey (Black Orpington), 460 eggs, £1 10s.; R. G. and E. Whalan (Langshan), 441 eggs, £1.

Light Breeds.—T. McDonald (White Leghorn), 432 eggs, £1 10s.; B. L. Blake (White Leghorn), 431 eggs, £1.

Summer Test (1st October to 31st December, 1928):—

Heavy Breeds.—B. S. Upton (Black Orpington), 367 eggs, £1 10s.; R. G. and E. Whalan (Langshans), 366 eggs, £1.

Light Breeds.—Bide-a-wee Poultry Farm (White Leghorn), 457 eggs, £1 10s.; F. T. Wimble (White Leghorn), 456 eggs, £1.

Autumn Test (1st January to 23rd March, 1929):—

Heavy Breeds.—L. Richmond (Black Orpington), 282 eggs, £2; B. S. Upton (Black Orpington), 273 eggs, £1 10s.

Light Breeds.—Bide-a-wee Poultry Farm (White Leghorn), 329 eggs, £2; F. T. Wimble (White Leghorn), 312 eggs, £1 10s.

Monthly Laying of Individual Prize Winners.

The following table shows the monthly laying of winners of the individual prizes for highest scores:—

Owner.	April.	May.	June.	July.	August.	September	October.	November.	December.	January.	February.	March (1st–23rd.)	
						Light Breeds.							
Neal Bros.	5	25	23	26	28	30	29	29	28	29	21	17	290
T. McDonald	22	24	23	24	26	27	28	29	26	24	20	13	286
T. Buckley	19	24	22	23	26	27	29	26	28	24	19	13	280
E. F Goldsmith	21	24	23	25	25	26	25	28	24	24	23	12	280
						Heavy Breeds.							
P. F. Miller	30	31	27	24	29	30	30	29	19	18	25	23	315
A. R. Wheatley	21	26	24	26	31	30	22	24	30	26	22	14	296
Mrs. V. E. Cox	23	26	27	26	30	29	30	21	25	13	17	15	282
Mrs. V. E. Cox	24	22	22	24	27	27	26	25	26	20	21	16	280

EGG-YIELDS OF EACH BIRD AND GROUP IN THE TWENTY-SEVENTH ANNUAL COMPETITION.

Owner and Breed.	Totals of Individual Hens.						Totals of Groups.	Weight of Eggs per dozen.	Market Value of Eggs.		
								oz.	£	s.	d.
Open Section : Heavy Breeds.											
Mrs. J. H. Madrers : Black Orpingtons.	216	173	255	*257	279	206	1,386	24¾	10	13	4
F. J. Ranken : Black Orpingtons...	262	*187	231	182	*249	235	*1,346	23¼	10	7	7
F. C. Nicholls : Langshans ...	193	260	239	253	233	164	1,342	25½	10	9	0
W. W. Tennent : Black Orpintgons	261	234	215	216	216	199	1,341	25	10	11	3
L. Richmond : Black Orpingtons	211	144	240	204	274	239	1,312	25	9	15	6
A. E. Ross : Langshans	183	259	224	220	194	224	1,304	25½	9	18	7
T. F. Braithwaite : Langshans ...	*190	153	278	*253	*179	250	*1,303	22½	10	6	2
W. Griffin : Langshans	172	236	179	†179	216	273	1,255	25¾	9	12	11
R. G. & E. Whalan : Langshans ...	191	238	188	198	226	210	1,251	25½	9	9	11
A. R. Wheatley : Black Orpingtons	*238	269	296	124	‡100	223	1,250	24	10	0	9
A. H. Moxey : Black Orpingtons...	213	179	‡165	241	173	271	1,242	24	9	15	7
A. W. Bower : Black Orpingtons	231	182	280	‡133	*275	‡129	1,230	25½	9	14	2
P. F. Miller : Black Orpingtons ...	315	‡196	†‡64	143	209	274	1,201	25	9	5	2
Woodlands Poultry Farm : Black Orpingtons.	155	184	94	253	266	228	1,180	25¼	9	4	4
C. Judson & Son : Black Orpingtons	258	‡91	254	263	‡101	196	1,163	25½	9	2	1
S. C. Zealey : Black Orpingtons ...	‡156	236	192	214	‡114	237	1,149	24¼	8	17	9
C. W. Gee : Black Orpingtons ...	198	253	143	‡151	213	*186	1,144	24	8	12	1
E. Jones : Black Orpingtons ...	230	155	127	216	223	193	1,144	25¼	8	8	2
W. C. Hardy : Black Orpingtons	199	‡219	161	215	210	*‡140	1,144	24½	8	9	0
F. Moulang : Black Orpingtons ...	251	172	163	198	233	†122	1,139	25	8	17	1
J. W. Smiles : Black Orpingtons ...	159	194	169	166	176	255	1,119	26½	8	2	8
Mrs. V. E. Cox : Black Orpingtons	268	‡146	106	‡27	282	280	1,109	25½	8	13	2
W. Jaquet : Black Orpingtons ...	258	‡85	199	224	111	228	1,105	26	8	11	4
B. S. Upton : Black Orpingtons ...	168	213	181	205	142	186	1,095	25¼	7	10	6
P. J. Hooker : Black Orpingtons	‡195	203	163	*235	98	†‡60	954	25	7	6	10
Open Section : Light Breeds.											
T. McDonald : White Leghorns ...	286	180	250	272	279	264	1,531	25¼	11	15	5
F. Crisp : White Leghorns... ...	275	225	229	266	240	228	1,463	25¼	11	4	1
Bide-a-Wee Poultry Farm : White Leghorns.	242	263	234	243	247	227	1,456	25½	10	17	0
S. E. Daley : White Leghorns ...	225	273	*276	*205	*235	231	*1,445	23½	11	5	9
L. A. Ellis : White Leghorns ...	237	235	199	231	247	269	1,418	25¼	10	14	2
W. J. Scarboro : White Leghorns...	206	240	271	236	241	222	1,416	26	10	15	7
Neal Bros. : White Leghorns ...	240	241	205	290	170	257	1,403	25	10	10	5
F. T. Wimble : White Leghorns ...	270	257	238	273	204	†140	1,382	25¾	10	7	5
A. W. Lewis : White Leghorns ...	171	235	278	228	208	249	1,369	25¼	10	3	9
J. Oates : White Leghorns ...	*260	155	224	233	‡239	255	1,366	24½	10	7	5
Parkhill Poultry Farm : White Leghorns.	220	218	246	235	191	253	1,363	24½	10	6	7
D. R. Dove : White Leghorns ...	213	229	163	*254	264	236	1,359	24¼	10	9	5
B. Clarke : White Leghorns ...	236	189	210	194	266	258	1,353	25	10	1	2
T. Buckley : White Leghorns ...	218	†193	219	255	175	280	1,340	25½	10	0	3
H. L. Abrook : White Leghorns ...	220	187	239	240	229	223	1,338	25½	10	7	9
G. N. Mann : White Leghorns ...	232	227	243	195	270	166	1,333	24¼	10	5	7
S. F. Cooling : White Leghorns ...	216	213	230	194	214	257	1,324	25	10	4	3
H. C. Bailey : White Leghorns ...	267	215	216	199	191	222	1,310	26¼	9	16	4
H. W. Jones : White Leghorns ...	244	222	225	260	164	187	1,302	24¾	10	1	8
H. P. Toop : White Leghorns - ...	273	234	237	*204	*84	266	*1,298	23½	10	2	1
N. Rosso : White Leghorns ...	221	205	206	184	218	252	1,286	26½	9	15	8
H. Cole & Son : White Leghorns ...	230	240	286	‡174	254	‡146	1,280	25	9	11	7
Macksville Poultry Farm : White	269	†185	181	208	166	268	.1,277	25	9	9	11
R. Whitelaw : White Leghorns ...	253	‡120	253	170	275	204	1,275	25	9	13	2
Watson & Stepney : White Leghorns.	*†111	†216	209	259	207	237	1,239	24	9	10	4
I. Lowery : White Leghorns ...	‡79	233	244	217	211	254	1,238	25¼	9	5	11
Hilder Bros. : White Leghorns ...	205	174	164	193	236	250	1,222	24¾	9	4	6
H. Holmes : White Leghorns ...	232	*218	‡154	177	†166	262	1,209	24¾	8	10	2
J. Rayner : White Leghorns ...	210	223	155	208	252	152	1,200	24¾	9	6	3
C. E. Brown & Son : White Leghorns.	†175	236	185	182	210	191	1,179	25½	8	14	6
F. A. Bailey : White Leghorns ...	149	207	214	205	†192	211	1,178	26¼	8	12	5
Bellingham Stud Farm : White Leghorns.	259	195	132	181	241	‡144	1,152	24¾	8	9	9
J. Every : White Leghorns ...	219	196	233	129	*207	167	1,151	24½	8	11	2

* Signifies ineligible for prizes, as eggs were under the prescribed weight of 24 oz. per dozen.
† Signifies bird replaced and previous score struck out.
‡ Signifies bird dead or withdrawn, not replaced, and score retained.

EGG-YIELDS OF EACH BIRD AND GROUP IN THE TWENTY-SEVENTH ANNUAL COMPETITION—*continued.*

Owner and Breed.	Totals of Individual Hens.						Totals of Groups.	Weight of Eggs per dozen.	Market Value of Eggs.		
Open Section: Light Breeds—continued.											
								oz.	£	s.	d.
Southern Cross Poultry Farm: White Leghorns.	*138	188	204	235	179	199	1,143	26¼	8	8	8
R. G. Christie & Son: White Leghorns.	241	240	*261	153	218	11	1,124	24¼	8	11	5
Kendrick Bros.: White Leghorns...	188	200	135	216	166	214	1,119	26½	8	9	0
P. O. Ranch: White Leghorns ...	180	†127	223	229	*†108	247	*1,114	23¾	8	0	0
A. Mobbs: White Leghorns ...	215	*144	231	*‡60	247	202	1,099	24	8	4	10
C. Leach: White Leghorns ...	221	202	230	199	98	146	1,096	24¾	8	6	1
W. E. Strickland: White Leghorns	261	243	132	223	199	‡30	1,088	25½	8	8	5
B. L. Blake: White Leghorns ...	239	187	‡129	236	132	151	1,074	25½	7	5	3
F. G. Lombe: White Leghorns ...	145	‡98	200	172	196	248	1,059	25¾	7	18	9
L. H. Rannard: White Leghorns,	179	‡119	172	216	226	146	1,059	25½	7	19	7
H. P. Christie: White Leghorns ...	134	205	122	182	203	204	1,050	25¼	7	10	4
R. B. Dent: White Leghorns ...	122	207	104	*282	226	95	1,036	25¼	7	15	1
W. J. Williams: White Leghorns ..	136	*188	†170	‡150	192	181	1,017	25	7	11	5
S. J. Evans & Son: White Leghorns	137	196	227	‡63	201	192	1,016	25¼	7	6	4
K. G. Cobcroft: White Leghorns...	209	64	228	56	210	249	1,016	25	8	4	6
H. W. T. Hambly: White Leghorns	‡80	216	193	218	98	201	1,006	25	7	11	5
A. Greentree: White Leghorns ...	140	160	210	147	160	171	988	25¼	7	11	10
P. Smith & Son: White Leghorns...	223	135	183	88	170	189	988	24	7	9	10
G. H. Floyd: White Leghorns ...	143	249	†88	147	†138	208	973	25¼	6	16	10
F. T. Turner: White Leghorns ...	170	164	†112	171	164	173	954	24½	6	11	7
E. F. Goldsmith: White Leghorns	216	280	168	126	97	4	891	25¼	6	12	5
J. L. Flew: White Leghorns ...	93	169	190	5	†184	227	868	24½	6	3	3
Standard Section: Light Breeds.											
F. C. Emery: White Leghorns ...	*225	198	271	179	213	216	1,302	25¼	9	13	7
J. Cornwell: White Leghorns ...	239	‡93	268	271	‡149	212	1,232	24¼	9	8	1
R. J. Devine: Anconas	211	163	†60	‡209	236	73	952	25½	6	13	5
Mrs. M. G. Cummings: White Leghorn.	‡147	*105	108	84	236	236	916	24	7	9	6
E. J. Clarke: White Leghorns ...	61	175	186	146	202	‡144	914	25	6	9	11
Standard Section: Heavy Breeds.											
P. A. Barrett: Langshans ...	214	214	232	186	197	216	1,259	26½	9	9	6
W. M. Mulliner: Black Orpingtons	68	*183	238	214	*230	210	1,143	24	8	13	9
G. L. Ardill: Col. Wyandottes ...	124	189	*208	153	188	*214	*1,076	23¼	8	3	0
R. M. Smith: Rhode Island Reds...	140	170	159	165	148	156	938	27¼	6	11	1
F. O. French: Col. Wyandottes ...	*164	*180	*154	*160	*87	*138	*883	21¼	6	4	10

* Signifies ineligible for prizes, as eggs were under the prescribed weight of 24 oz. per dozen.
† Signifies bird replaced and previous score struck out.
‡ Signifies bird dead or withdrawn, not replaced, and score retained.

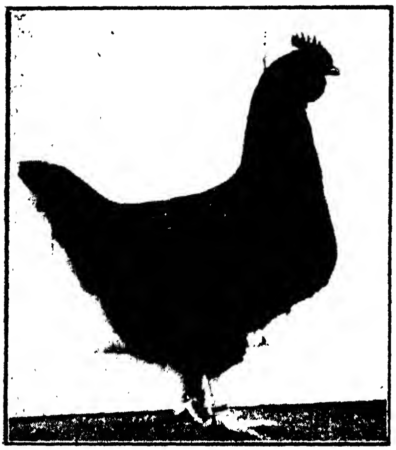
COMMENTS BY THE POULTRY EXPERT.

The test just concluded is not conspicuous as far as putting up fresh records is concerned. The nearest to achieving a record score was the winning group of White Leghorns owned by Mr. T. McDonald, which won the Grand Champion Prize for greatest value of eggs, and laid 1,531 eggs. This number has been passed only once before by the same breed, and that was in the thirteenth test, when the winning team laid 1,541 eggs. Another group laid 1,531 in 1926-27. Heavy breeds have exceeded that score four times during the currency of the Hawkesbury Agricultural College tests.

This is the third year in succession that White Leghorns have put up the highest group score. The general average for the breed, however, is somewhat lower than last year, as also is the average for heavy breeds, which is

much lower than last year. This, together with the low group scores of the Black Orpingtons, should spur breeders on to greater efforts towards improvement of their birds.

Langshans have added to their popularity by putting up the highest breed average for this test, the average being 215.2 eggs. Of course, it has to be taken into account that this breed is only represented by five groups in the open section and one in the standard section.



Mr. P. F. Miller's Black Orpington Hen. Highest Individual Score (315 eggs).

The general average for the competition again suffers in comparison with last year, being 199·1, which is 3·8 below last year's figure. The heat waves in January, followed by the excessively wet weather later, appear to have adversely affected production during the last three months, and caused a greater mortality and an earlier breaking into a moult than usual.

The average weight of eggs for the light and heavy breeds in the open section was 25 oz., which is practically the same as last year, when the figures were 25½ oz. for the light breeds and 25 oz. for the heavy breeds. This leaves room for improvement, and poultry-farmers should give careful consideration to the matter in their breeding.

Main Prize-winning Groups.

Mr. T. McMcDonald's team of White Leghorns wins the Grand Champion Prize for the greatest value of eggs with a group score of 1,531 eggs, which is 68 eggs ahead of the second team in that section and 145 eggs higher than the leading team of Black Orpingtons.

The prize for the greatest number of eggs in the Heavy Breed Section was won by Mrs. J. H. Madrers, the total being 1,386 eggs.

The valuable Golden Egg Trophy (£25), donated by the Metropolitan Meat Board, and awarded on points of standard quality, also value and quality of eggs, goes to Mr. L. A. Ellis, whose group of White Leghorns scored 75¼ points and laid 1,418 eggs.

Mr. F. C. Nicholls' team of Langshans closely followed the winning group, and wins the Metropolitan Meat Board trophy of £10 (judged on the same scale of points as for the Golden Egg Trophy), with 70¾ points and a total of 1,342 eggs.

The J. Hadlington Commemoration Medal, which is being awarded for the first time in this test, for a team laying at least 1,100 eggs of standard weight, and on points for quality and weight of birds and eggs, was won by

Mr. P. A. Barrett (Langshans), with 75½ points. This pen also laid the highest number of eggs (1,259) in the Standard Heavy Breed Section, and wins the prize for that section.

Only one hen exceeded the 300-egg mark; this was Mr. P. F. Miller's Black Orpington, which scored 315 eggs, gaining the prize for the highest individual score.

It is pleasing to again find the cost of feeding at a lower level, the figure being 8s. 7d. per head, as compared with 9s. 7d. last year. The average price of eggs, based on ruling Sydney market prices for new laid eggs, was 1s. 9½d. as against 1s. 10d. last year. This, however, does not take into account the lower returns for portion of the eggs during the nine weeks of export, which would reduce to some extent the average price, but even when allowance is made for this factor it shows a satisfactory state of affairs in the economic position of the industry.

Progress in Fluke Control.

It is doubtful if any work of the Department of Agriculture has had such rapid results as the recommendations regarding the treatment of fluke-infected sheep with carbon tetrachloride. The drug is now in general use in the known fluke-infested districts. In districts where it was known to be unsafe to keep sheep, owners have stated that they no longer fear the fluke, and information is to hand that following the discovery of the efficacy of the drug, properties on the eastern falls of the mountains have already increased in value. Some instances of losses in sheep following the use of carbon tetrachloride have been reported, but the reason for these losses is obscure.

Carbon tetrachloride has been found equally efficacious with cattle, but there appear to be indications that it has somewhat untoward effects on milch cows. The District Veterinary Officer (North) states that information has been received that the milk is tainted by the drug, that cattle lose their appetite, and that the milk supply diminishes for a week or so after the administration of the drug.

By continuing the treatment of the sheep with carbon tetrachloride and so destroying the fluke, and the treatment of the watercourses, swamps and springs with copper sulphate in order to destroy the snails, the eradication of fluke on any property may be rapidly brought about. What was considered one of the chief drawbacks to sheep-raising in the tableland districts of New South Wales has thus been completely overcome.—Max Henry, Chief Veterinary Surgeon, in *Live Stock Diseases Report*, No. 4, 1928.

Cultivation Pays.

During the recent dry spell, the driest on record, writes Mr. R. H. Dixon, of Millthorpe, I grew peas, yielding about 50 bushels to the acre, and not more than 27 points of rain fell during the growing period. No fertiliser was used. The ground was fallowed in early spring when dry enough to plough, and kept continually worked. The price averaged was £1 per bushel, so that it proved an exceedingly profitable crop.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36A, G.P.O., Sydney, not later than the 12th of the month.

Wheat—

Aussie	J. Parslow, Balladoran.
Canberra	E. J. Johnson, Wongalea. B. J. Stocks, Cunningar. Manager, Experiment Farm, Condobolin. Manager, Experiment Farm, Trangie.
Clarendon	C. T. Anderson, Swan Vale.
Cleveland	W. Burns, Goongirwarrie, Carcoar.
Federation	E. J. Johnson, Wongalea.
Florence	Manager, Experiment Farm, Trangie.
Hard Federation	Manager, Experiment Farm, Trangie.
Marshall's No. 3	B. J. Stocks, Cunningar.
Nabawa	Cullen Brothers, Dubbo. H. J. Harvey, Dubbo.
Queen Fan	C. T. Anderson, Swan Vale.
Riverina	Cullen Brothers, Dubbo.
Union	Manager, Experiment Farm, Temora.
Waratah	R. O. Stiles, Narromine. E. J. Johnson, Wongalea. T. W. O'Brien, Junee Reefs. B. J. Stocks, Cunningar. Manager, Experiment Farm, Condobolin. G. T. Troy, Bland, Quandialla. Manager, Experiment Farm, Temora. Manager, Experiment Farm, Trangie.
Yandilla King...	R. O. Stiles, Narromine. Quirk and Everett, Wellington.

Tomatoes—

Sunnybrook Earliana	A. E. Johnson, Green Valley, via Liverpool.

Onions—

Early Improved Hunter River	S. Redgrove, Sandhills, Branxton.
Early White Hunter River ...	S. Redgrove, Sandhills, Branxton.
Hunter River Brown Spanish	C. J. Rowcliffe, Fairfield, Dubbo.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Orchard Notes.

May.

C. G. SAVAGE AND W. LE GAY BRERETON.

THERE is generally a breathing space between the packing season for deciduous fruits and the start of the winter orchard work. Before closing down the packing shed it should be thoroughly cleaned up. All cases and other receptacles which have held fruit infested with codling moth or fruit fly should be dipped in boiling water for not less than three minutes. All benches and other equipment that cannot be dipped should be carefully searched for larvae or pupae by probing into any cracks with a wire. Where canvas or sacking is used for packing bins it should be dipped in boiling water.

Pests and Diseases.

Woolly Aphis.—In most apple districts the woolly aphis parasite, *Aphelinus mali*, keeps this pest well in check and it is now very little in evidence in the autumn. The pest is sometimes found, however, in odd orchards, and where this is the case and the trees are badly infested with woolly aphis, an application of tobacco wash or nicotine sulphate could be given at the end of this month to clean up the trees. When such a contact insecticide is used during the dormant period, *i.e.*, while the parasites are in the pupal stage, very little harm will be done to them.

When spraying for woolly aphis it is necessary to use a high pressure and to hold the nozzle close to the infested parts, so as to break up the clusters. Spraying in this manner uses a lot of spray, which collects about the butt of the tree, and for this reason it is preferable to use tobacco wash rather than an oil spray if the trees are badly infested, as an accumulation of oil spray around the butt of the tree is very liable to cause damage.

Codling Moth.—Bandages for codling moth should not be removed from pome fruit trees till June. When they are being removed see that all grubs harbouring therein are killed. Even when the grubs have been removed from the bandages soon after all the fruit has been harvested at the end of the season, it is not uncommon to find grubs in the same bandages later in the winter. In districts where shot-hole fungus is prevalent on apricot and cherry trees they should be sprayed with Bordeaux mixture (6-4-22) when the leaves start to fall, or shortly after they have fallen.

Citrus Scale.—Fumigation can still be carried out on citrus trees infested with scale, and which have not been dealt with earlier. Late fumigation generally gives a satisfactory kill and thus benefits the trees, but much of the dead red scale will adhere to the fruit.

Resoiling and Manuring.

If the ground is not too wet it is good time to carry out resoiling. Cart out all available farmyard manure or other bulky organic matter which will increase the humus content of the soil.

Pruning.

There is a general opinion that pruning deciduous trees early is risky, it being thought that, if warm wet weather follows, the trees are more liable to shoot when pruned. It has to be admitted that experiments carried out by the Department have failed to prove or disprove this contention. However, if the weather is fine during May it is generally more economical in large areas to start pruning and so get the work well in hand, for, if delayed, bad weather may cause further delays, and pruning then clashes with the other winter work, and often the winter ploughing is postponed to the detriment of the trees, especially in dry seasons.

Destroy Your Waste Fruit.

To make the most economical use of the time available, a start should be made on those deciduous trees, such as apricots and peaches, which lose their leaves earliest and which start growth in the spring first. Those that have not so far used an orchard burner for disposing of prunings should try it out this season. It is a far cheaper means than carting off.

Where no green manure crop has been sown, the autumn ploughing, as described in these notes for March last, if not already carried out, should be completed early this month.

An Orchard Pit.

The Leeton cannery this year has put in a covered pit for disposing of waste fruit, after the idea described by Mr. T. McCarthy, Senior Assistant Entomologist, in the *Agricultural Gazette* for January, 1929, and since issued in pamphlet form. As this pit was on the roadside, Mr. T. N. Powell, Orchard Inspector at Leeton, seized the opportunity of drawing the attention of the passing orchardist to its usefulness by getting the cannery authorities to erect the notice shown in the accompanying illustration.

Poultry Notes.

MAY.

E. HADLINGTON, Poultry Expert.

THOSE who contemplate an early commencement of hatching operations, and who are depending upon first and second year hens, will now be experiencing the usual difficulty of securing, for the breeding pens, sufficient birds that are through the moult. There will be some hens, of course, which have not yet moulted and are still laying, but these are not the best to use for breeders and should be passed over if it is desired to hatch out strong robust chickens. because such birds have not had a chance to recuperate after a heavy laying season. This is where early hatched pullets are a valuable asset, and there need be no hesitation in using them as breeders provided they are at least ten months old and have attained satisfactory development. If such pullets are not fit to breed from now they never will be, and although some birds may be going through a partial moult, these will be ready before most of the hens. On no account, however, should pullets be used unless they come up to the weights specified in last month's notes, viz., 4 lb. for light breeds and 5 lb. for heavy breeds.

Consider the Size of Eggs.

One of the most important matters in connection with the breeding season which should be kept constantly in mind is the question of the size of eggs. There is a temptation in the early part of the season, when eggs are scarce, to use a percentage for incubation which does not come up to the required standard. Then the next season some of the early birds used for the breeding pens may be from the small eggs, which would tend to perpetuate the trouble. Therefore, it should be made a hard and fast rule that no eggs under 2 ounces in weight be used for incubation. The fact that the percentage of small eggs in our competitions is on the increase, and also that this is a problem to be dealt with in connection with marketing and export operations, should impel the poultry farmer to make greater efforts to increase the size of eggs from the whole flock.

It should be realised that the remedy lies in the poultry farmer's hands, and it is only by persistent effort that improvement will be effected. If every poultry breeder adopted the slogan "Produce Larger Eggs" and did not let up in the endeavour to achieve that objective, the trouble would soon be overcome. The production of larger eggs would tend towards increased consumption, and would make a material difference in the profit to the farmer. Now is the time to commence building up, and the first step is to see that breeding stock of sound physique only are used, and follow this up by a rigid selection of eggs for incubation.

A Tonic After the Moult.

It will be found that a tonic given to the birds at this time of the year, as they are recovering from the moult, will assist materially in bringing them into laying conditions again; it will also benefit birds recovering from chicken-pox. One of the best and cheapest tonics for poultry is Douglas mixture, which is easily compounded.

The preparation is made as follows:—Dissolve 4 ounces of sulphate of iron and 4 ounces of Epsom salts in 1 gallon of boiling water, let this cool, then add half an ounce of dilute sulphuric acid. Care should be taken to obtain the acid in dilute form, not the concentrated sulphuric acid, which is of much greater strength. Most chemists are able to supply all the ingredients required, and the mixture can be made up for about 6d. per gallon. When the mixture has been prepared it should be stored in a glass, porcelain, china, or earthenware vessel and labelled as poison. The dose is two tablespoonfuls to each gallon of drinking water, and should be given four to five times a week for about a month, or longer if necessary. It is useless to give only a few doses, a regular course of treatment being necessary to bring about the desired effect.

Some poultry farmers hesitate to use this tonic because they think it is likely to rust the iron water vessels, but if made and used in accordance with the directions given above it will have only a staining effect upon the vessels. It will, however, cause kerosene tins to rust through somewhat quicker than usual.

Egg Marketing Board.

There appears still to be a great deal of misapprehension, particularly among small poultry keepers, regarding the functions of the Egg Marketing Board.

By many the Board is regarded as a body that is going to deprive them of their liberties and harass them in every way. There is much misunderstanding, too, among those who keep a few fowls for household use and sell any surplus eggs as to what action they have to take to comply with the regulations of the Board. For the information of the latter class it may be stated that when the Board assumes control of the eggs produced in the counties of Cumberland and Northumberland and the shires of Wollondilly and Nattai, any person in those areas who keeps twenty female birds or over must either sell their eggs to an authorised agent of the Board, or apply for an exemption to sell as desired. In cases where an exemption is obtained it will be necessary for the producer of the eggs to sell at a price not lower than that fixed by the Board and to keep an account of all eggs sold, and furnish a return of same to the Board each month, together with the amount of any levy imposed.

As far as commercial poultry farmers are concerned, the same conditions apply, and it is necessary for those who sell day-old chickens and eggs for incubation to obtain an exemption in respect of the eggs used for producing chickens for sale and those sold as settings, and furnish a monthly return to the Board, together with the amount of levy fixed.

The aim of the Marketing Board should be to bring about an organised system of marketing eggs, which will ensure a reasonable return to producers, who will all share a proportionate part of the expenses incurred or benefits accruing from any pooling system which may be decided upon. Without some pooling system during the export season the price of eggs would come down to export parity, which would mean heavy loss to the poultry farmer. Under the new order, instead of the state of affairs which hitherto existed, whereby the contributions to a voluntary pool were borne by a minority of poultry farmers whilst the others obtained the higher local prices, a more equitable system will be brought about.

The efforts of the Board should be directed towards supplying the consumer with eggs that are reliable as regards freshness and grading, so that "Board" eggs can be relied upon. Thus will be removed the common causes of complaints now so prevalent. By gaining the confidence of the public, consumption will be increased and the producer will benefit by the greater demand.

Utility Classes at the Royal Show.

This year again the outstanding feature of the utility classes at the R.A.S. Show was the breeding teams of six females and a male. Altogether forty-six teams competed, comprising 322 birds, being chiefly White and Brown Leghorns, Black Orpingtons, Langshans, and Rhode Island Reds.

The birds in most of the teams were of a very high order, conforming very closely to standard requirements and embodying essential utility qualities. The same applies to most of the birds in the single utility classes. The fact that birds of such high quality can be exhibited by commercial poultry farmers is a sure indication that there is a gradual awakening to the necessity for maintaining the type and character of the breeds being kept.

The fallacious idea that good quality birds and high egg production are incompatible is now being discarded, and enlightened farmers are beginning to look upon quality as an essential factor in their flocks, just as progressive breeders of other classes of stock recognise the importance of securing the best "blood" obtainable. Thus, the common-sense outlook of the up-to-date commercial poultry farmer should assist in breaking down the prejudice against standard bred birds and thereby help towards a general improvement of the flocks, which is of vital economic importance to the industry.

H.A.C. Egg-laying Competition.

A pleasing feature of the Hawkesbury Agricultural College egg-laying test just commenced is that the number of rejections for underweight birds was much below previous years, only ten not coming up to the required weights. There was also some improvement in the type of Black Orpingtons penned and although many birds fell short of what could be desired, if the same effort is made each year to pen more typical birds a general uniformity will soon result.

The quality of the Leghorn section is, on the whole, somewhat better than last year, but some competitors would do well to pay more attention to uniformity, as in a number of cases three or four out of the six birds penned were of one type and size and the rest totally different. In other instances good pens were spoilt by the inclusion of perhaps one or two birds having faults, such as a "spriggy" comb, eyes of the wrong colour, &c., which preclude them from being selected for the quality prizes.

In the standard sections only White Leghorns are competing in the light breeds, and Orpingtons and Langshans in the heavy breeds, there being two pens of the former and three of the latter. Some of the pens in both sections are of excellent quality and uniformity.

The Value of the Rigid-tine Scarifier for Fallow Preparation.

Some of the most important things in fallowing are to keep down the weeds and to get the subsurface packed quickly. To these ends I use the springtooth and rigid-tine scarifiers. I would like to stress the importance of the latter machine. I consider the rigid-tine scarifier far ahead of any other machine for working the fallow. The scarifier cuts the weeds out better and it packs the subsurface soil more than the springtooth. With the wide points on, and laying flat on the bottom, it leaves the bottom of the fallow level—without ridges. This is a bad point of the springtooth—it leaves the bottom of the land very uneven, and if it strikes hard ground the points rise up, while in loose patches they sink down too deep. The scarifier can be set at any desired depth, and it does not rise or lower to any great extent. It works the land at a uniform depth all over, and when the land is in that state it means that a very even germination of the seed is the result when sown.

This year I have had good results with the scarifier. I have worked up a large area, and I have not used the plough at all. This may appear strange, not to plough the land at the first working. When I have worked up the fallow that way it is perfect—could not be better. On this self-mulching friable soil I prefer it to the plough, it does equally as good a work. It cheapens the cost of the first working, as the plough covers about 5 ft. 6 in., and the scarifier 8 ft. 6 in., and a much larger area can be got over in a day. Another good point about it is that it leaves the top of the land in ridges. Generally, in the summer the rains are mostly heavy storms, and the water starts to run quickly. By having these ridges the water is held better, and therefore has a better chance of soaking in. By having the ground very flat, such as it would be after harrowing, a good deal of the water runs off.—J. H. McDonald, at Narrabri Bureau Conference.

Sheep-classing is one of the most important, though most neglected, practices in the management of the flock. It should be treated by the sheepowner in the same light as the wheat-farmer regards fallowing; it should be done each year to ensure the greatest return.

CONTENTS.

Agricultural Gazette of New South Wales.

Exanthema of Citrus in New South Wales.

F. C. McCLEERY, B.Sc.Agr., Assistant Biologist.

ALTHOUGH exanthema has caused serious losses in citrus for many years and is now regarded as the most important citrus disease in the coastal areas of New South Wales, no detailed discussion of the disease as it occurs in this State has previously been published. In a subsequent article it is proposed to report the results of experiments which have been conducted recently with the copper treatments for the control of the disease, and it seems opportune here to give a full description of the disease and of the conditions under which it occurs.

History and Distribution.

Exanthema has been recorded from most of the important citrus countries of the world with the exception of South Africa (9). Fawcett and Lee (3) report its occurrence in Florida, California, Cuba, Porto Rico, Yucatan, Dutch Guinea, Brazil, Philippines, Hawaii, Italy, and Australia.

The early literature in Australia reports occurrences of "dieback" in citrus trees, but no mention is made of any of the diagnostic symptoms, and it is probable that most of these references are to dieback other than that caused by exanthema. It seems likely, however, that the disease has been present in New South Wales ever since citrus trees have been grown on the types of soil on which it develops, and it has certainly been present here since 1909. It was described by Brittlebank (1) in 1912, and his observations appear to refer to its occurrence in the Gosford district of New South Wales Wickens (10) refers to the disease in Western Australia in the following terms: "I cannot definitely state the year when I first saw infected trees, but I believe it was in 1912, and at that time trees showing its effects were so limited in numbers that special attention was not drawn to them. This comparative freedom of the orangeries in Western Australia continued until 1920, when suddenly the disease manifested itself in many places . . . ." Carne (2) also records it from Western Australia, where he states: "Though not one of our important citrus diseases, it occurs more or less throughout our orange-growing areas." He records it only on oranges and infers that lemons and mandarins are not susceptible.

In New South Wales the disease is confined almost entirely to the coastal citrus areas. Throughout the Mangrove Mountain-Gosford-Wyong-Dora Creek section of the coastal area the soils are principally of a sandy nature and exanthema is general in a high percentage of the orchards. It is considered to be, over a period of years, the most important disease of citrus, although in certain seasons black spot (*Phoma citricarpa*) may cause more

spectacular and possibly greater economic damage. In the Hills districts of the County of Cumberland it occurs in more or less scattered areas on soils of a sandy type and is of considerable importance. In the other portions of the coastal section it is of minor importance, but is recorded from Bulga, near Singleton, and from Grafton. In inland districts it is extremely rare, having been recorded only from one farm on the Murrumbidgee Irrigation Area.

Nature of the Disease.

Despite the wide distribution of exanthema, the nature of the disease has not yet been determined. No parasitic organism has ever been shown to be consistently associated with its occurrence either in Australia or elsewhere, and histological studies of diseased tissue indicate that it is a result of some general physiological disturbance within the trees rather than of attack by a parasitic organism. The very definite manner in which its occurrence is restricted to certain soil types and soil conditions in New South Wales, and the fact that it does not usually appear until the trees have been planted for at least two or three years, support the view that it is a disease possibly of malnutrition.

Lipman ([7]) has advanced the hypothesis that it is a result of soil conditions in which the supply of nitrogen available to the tree is below normal. Floyd ([5]) suggests that it is due to the assimilation of some injurious chemical compound or compounds formed by the decomposition of the organic matter either added to or residual in the soil. He reports producing the disease in young trees in the greenhouse by feeding them with stable manure and cottonseed meal ([4]).

Susceptibility of Varieties.

No differences have been noted in the susceptibility of the citrus varieties to the disease in New South Wales. Oranges, lemons, mandarins, and grapefruit are all known to be susceptible. The gross symptoms of the disease are different on mandarins, lemons, and oranges as is described below, but the reduction in yield is here considered to be approximately the same in each case. In America, Grossenbacher ([6]) states that it is most noticeable on grapefruit, while Winston ([11]) considers the orange to be more susceptible than the grapefruit. Smith and Thomas ([8]) have recently reported a disease similar to exanthema on prunes, apples, pears, and olives in California, and conclude, from the efficacy of the bluestone treatment, that the disease is identical with exanthema. There is no evidence of the occurrence of the disease on any host other than the several citrus species in New South Wales.

Symptoms of the Disease.

Exanthema is a unique disease in the large number and in the diversity of its symptoms. The type of damage which it occasions varies from the marking or dropping of a small percentage of the fruits to the continuous yearly loss of the whole crop, and from slight abnormalities in growth characters of the

foliage to the continual dying-back of the terminal shoots, resulting in the development of an absolutely valueless, completely stunted, staggy, unproductive tree. The whole tree is usually attacked, but frequently one sector is found more severely diseased than the remainder of the tree and, in a few cases, only one sector may show exanthema symptoms.

Primarily, the disease is one of the fruit and of the terminal branches, twigs and leaves, abnormalities in which give affected trees as a whole a characteristic appearance. Trees in which the twigs are severely affected are easily picked out by the quantity of dead shoots that they carry. More often, however, trees are less severely diseased and, in the orchard, it is the general character of growth of the foliage which is most helpful in locating affected trees.

Fig. 1.—Oranges Affected with Exanthema.

A. Type of small, pale fruit which falls prematurely from the trees (natural size).
B. Mature fruit showing gum markings and splitting of the rind (about half natural size).
C. Mature fruit showing gum marking (about half natural size).

Diseased trees usually have a more or less bunched habit of growth, a characteristic produced by a shortening of the internodes of the terminal twigs and the development of a number of shoots from each node. The bunching may be, and usually is, of a comparatively slight type, or may be so pronounced as to give the tree the appearance almost of a clipped hedge. Even the general bunched appearance, although usually present, is not always to be found in affected trees; for example, the disease has, in a few cases, been observed in a high percentage of the fruits on particular trees where no abnormality whatever could be detected in the foliage. Trees are frequently to be seen in which the only symptoms are the fruit markings and a very slightly bunched growth of the foliage.

A second general symptom is to be observed in the colour of the leaves on affected trees. The foliage of trees attacked by exanthema is usually somewhat darker green in colour than that of healthy trees; sometimes the colour difference is very pronounced and the green of affected trees has been termed "leaden." In periods of drought such trees are particularly noticeable as contrasted with the pale and wilted foliage of normal trees.

The individual abnormalities in fruit, leaf, and twig are very numerous and the description of the disease is rendered difficult because there is no single symptom which is consistently present in affected trees. There are a

number of symptoms in which gum is produced, viz., bark excrescences, stained terminal twigs, gum pockets and stained fruits, and these are termed primary symptoms. A large number of other minor or secondary symptoms usually also occur in affected trees together with one or more of the primary symptoms. It is generally considered that the disease can be diagnosed definitely only when one or more of the primary gum symptoms are present, but, in certain cases, trees showing a combination of several of the secondary symptoms of exanthema, and growing under similar conditions to diseased trees, perhaps in the same orchard area, must be considered also to be attacked by exanthema.

(a) Fruit Symptoms.

The fruit may fall prematurely, either soon after blossoming, or at any stage until about half-grown. Such fruits (Fig. 1A) are small and hard and distinctly pale (yellowish) in colour, normal fruit being dark-green at this stage. They are often marked with gum spots, are deficient in juice content, and frequently contain accumulations of gum in the centre of the fruit at the angles of the segments.

On fruits which remain on the trees to ripen the principal symptom is a gum staining or blotching (Figs. 1B & C). This may take the form of an impregnation of whole areas of the superficial cells of the rind with a brownish gum; or slightly raised patches of hard glossy gum may cover parts of the fruit surface, or portions of the surface of the fruit may be spotted with small dots or pinpoints of gum. Badly affected specimens may be practically covered with these irregular discoloured areas. The colour of the gum is usually a light brown or reddish brown, but may be almost black. Exanthema markings are typically distinct from those produced by melanose, but it is sometimes difficult, on particular fruits, to differentiate between the two diseases. In exanthema, the gummed areas typically consist of a more or less dense central gummed area surrounded by numerous small, scattered pinpoints of gum. In bad cases, the fruits may be distorted and malformed, they are usually pale in colour (yellow straw colour, as compared with the normal red-orange colour of ripe orange fruits), and may have accumulations of clear gum in the interior of the fruit near the seeds. The rind sometimes adheres closely to the fruit, which is hard and may split open (Fig. 1B). Small cracks may also occur across the areas of gum on the fruit surface. This splitting is not to be confused with that produced on mature healthy fruit by excessive rain.

(b) Small Branch and Twig Symptoms.

Pockets of gum may occur in rapidly growing, succulent shoots, and, as a result of internal pressure, produce definite blister-like swellings on the surface of the twig (Fig. 2B). The gum pockets occur only on the flat sides of angular shoots which have not hardened. They are usually situated near the nodes, about midway along the twig. The pressure of gum is sometimes sufficient to burst the outer tissue and gum then exudes from

the pocket onto the surface of the twig. The gum-pockets become buried under new wood as the twig grows. Twigs of the type which develop gum-pockets are often limp, and grow into an S shape before they harden.

One-year-old wood and vigorous shoots of the current season's growth may be covered with an exudation of hard, brown or reddish gum (Fig. 2A). This gum escapes through longitudinal fissures in the bark and usually occurs as distinctly raised, elongated ridges along the twig. The gum is gradually dissolved and the wood appears normal in the following season.

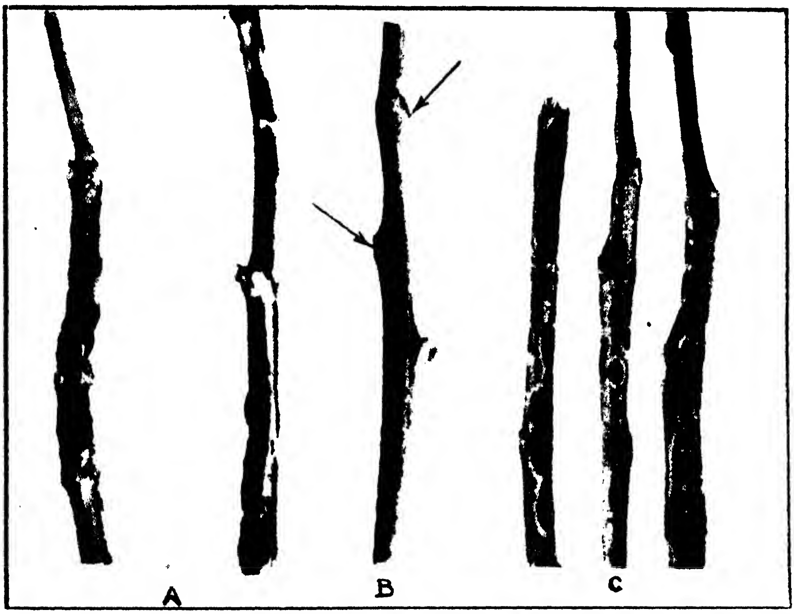


Fig. 2.—Orange Twigs Showing Exanthema Symptoms.
A. Gum exudations on surface of sub-terminal twigs.
B. Gum pockets in twig at the two points indicated.
C. Gum-stained terminal twigs.

Young terminal shoots may be covered with a uniform, varnish-like coating of glossy, brown gum; or are frequently yellowed and dotted with more or less circular blobs of gum (Fig. 2C). Twigs showing the gum symptoms usually drop their leaves and then die, giving the common, but inappropriate, name of "dieback" to the disease.

Shoots showing the above gum symptoms frequently also produce multiple buds (Fig. 3), *i.e.*, an accumulation of twenty to thirty shoot buds in the leaf axils which frequently do not develop further. A number of shoots may commence to grow from the multiple buds, but the growth is usually weak, with the result that a bunch of short thin twigs occurs in place of the one or two twigs normally produced. The internodes of affected twigs are often shortened (Fig. 4), and the result is a rosette-like growth which gives the tree a dense, bushy appearance. The occurrence of large groups of

buds, particularly when gum exudes among them, is an almost certain indication of exanthema, but it must be noted that multiple buds are also found in other citrus diseases, *e.g.*, foliocellosis.

(c) Leaf Symptoms.

Trees about to develop exanthema frequently produce unusually large, dark-green leaves. Such leaves, however, also occur on vigorously growing shoots on young healthy trees. The leaves of badly diseased older trees are often dark green or "leaden" in colour and are abnormally thick, and in some instances are abnormally narrow or linear. In many cases these thick narrow leaves do not develop chlorophyll (green colouring matter) in between the larger veins on the leaf—a symptom known as frenching. Quite commonly, leaves of normal shape and green colour develop frenching or other types of chlorotic mottling in which white areas of various sizes and distributions replace parts of the green leaf area. Both mottling and frenching are, however, symptoms of abnormalities other than exanthema, *e.g.*, those due to frost or cold injury and to certain mineral deficiencies. Spots of gum may also be produced on the leaves by exanthema, but these are liable to be confused with gum spotting induced by sunburning or with melanose spotting.

Comparison of Symptoms on Orange, Lemon, and Mandarin Trees.

The exact expression which the disease takes depends primarily on the soil type. The age and general condition of the tree is also important. In trees producing strong vigorous growth the gum and dieback symptoms are usually prominent, whilst in trees which are developing less vigorous growth the fruit marking and the secondary symptoms predominate.

Young, vigorously growing orange trees typically show a pronounced development of gum symptoms—bark excresences, stained terminal twigs, gum-pockets, marked and stained fruit—accompanied by the continuous dying of the terminal twigs and fall of young fruit. In many such trees all the typical symptoms of exanthema are to be observed. In older trees and those in which the growth is not so strong the chief symptom is frequently the paling and marking of the fruit, accompanied by comparatively minor differences in tree habit. Grapefruit, from relatively few observations, appear to be similarly affected.

Mandarin trees seldom develop the pronounced gum symptoms on the twigs such as occur in oranges. The chief diagnostic symptoms are the fruit marking and the fall of young fruit. Also, affected mandarin trees usually show a pronounced shortening of the internodes, resulting in a bushy habit of growth. The leaves on such trees frequently have a tendency to curl inwards, with an undulation along the edges.

In the case of lemons, the foliage of diseased trees usually acquires a dense, bunched appearance resulting from the shortening of the internodes and the development of twigs from multiple buds. The gum symptoms are not a

pronounced feature of the disease. Fruit production is frequently prevented or the crop is considerably reduced by the fall of fruit in the early stages. Marking of mature fruit is not a common feature.

Fig. 3.—Multiple Buds on Grapefruit Twigs; the Right-hand Twig also Showing Gum Exudations.
[*After Grossenbacher*]

Soil Conditions.

There are two subsoil conditions—(1) lack of drainage and (2) the presence of hardpan near the surface—which appear to favour the development of exanthema everywhere. The disease, however, occurs commonly on deep, well-drained soils.

In the coastal areas of New South Wales the soils of the areas in which the disease has developed are either sands or sandy loams, derived principally from Hawkesbury sandstone. On such soils the disease may, and often does, appear in quite a mild form, but it is to be found year after year in

Fig. 4.—Orange Branch Showing Bunched Growth; also Dieback of Terminal Twigs Resulting from Exanthema.

affected orchards. It reaches its maximum development on a certain type of almost pure, coarse, white sand, and on this type of soil the dieback and gum symptoms invariably attain a high degree of development on all types of citrus. Rare occurrences on alluvial sandy soils have been reported, but

in such cases the disease usually disappears after a season or two. Loam soils derived from Wianamatta shale predominate in the County of Cumberland, but the disease has not definitely been recorded on them, although certain of the secondary symptoms of exanthema did appear in some orchards on these soils in the season 1927-8. It has never been observed in volcanic soils in New South Wales.

In Florida, U.S.A., where exanthema is common, and where there is also a preponderance of sandy soils, it is stated (5) that the use of stable manure or of organic nitrogenous fertilisers in excessive quantities will often cause the development of exanthema. The experience in coastal areas in this State is that the addition of organic matter to the soil in the form of farmyard manure, offal, bush-scrapings, &c., has never been found to increase the severity of the disease, and has, in many instances, brought about a recovery from exanthema, as has also the use of a good soil for resoiling. There is, however, a suspicion among some growers, which may or may not be justified, that continual fertilisation with blood and bone favours the disease in some instances. On the Murrumbidgee Irrigation Areas there is one case of exanthema known where the disease has been induced where citrus were planted on an area which is said previously to have been a sheep camp. In California, U.S.A., on heavier types of soil the experience seems to agree with that in New South Wales, that farmyard manure is generally beneficial, and this is true, too, in some localities in Florida (3).

Floyd (5), in Florida, has stated that excessive cultivation of the soil is apparently conducive to the development of exanthema and has recommended the entire cessation of cultivation or the use of as little cultivation as possible. According to Fawcett and Lee (3) the common practice there is a modification of cultural operations to avoid any ploughing in orchards where exanthema is prevalent. The disc harrow is used in its place to break up sod and the land is harrowed occasionally during the spring months until the rainy season begins. Grass, weed and cover crops are allowed to grow in the summer and are cut in late summer and used as a mulch around the trees. There is no evidence in New South Wales that cultivation has any effect on the disease.

Summary.

1. Exanthema has been known in New South Wales at least since 1909.

2. It is considered the most important citrus disease in coastal areas and is prevalent in citrus orchards, particularly in the Mangrove Mountain, Gosford, Wyong and Dora Creek districts and in isolated areas in the Hills districts of the County of Cumberland.

3. It is probably a malnutrition disease.

4. All types of citrus are susceptible, but the gross symptoms of the disease are typically different on oranges, lemons, and mandarins.

5. The diagnostic symptoms of the disease are the gum symptoms, namely, bark excrescences, stained terminal twigs, gum pockets and marked fruits.

A number of secondary symptoms also usually occur. Diseased trees may show pronounced twig dieback. The most general symptoms are a bunching and dark green colour of the foliage.

6. Lack of drainage and the presence of hardpan favour exanthema.

7. It is very definitely associated with sandy soil types in New South Wales.

8. The addition of organic matter to the soil is beneficial in New South Wales and cultivation is not known to have any effect on the disease.

Results of experimental work on the control of this disease will be reported in the next issue.

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Dairy Science Schools.

During the next six months the Department of Agriculture has arranged to hold a number of dairy science schools throughout the State for the convenience of dairy produce factory employees who are desirous of qualifying as cream graders and milk and cream testers under the Dairy Industry Act. The centres at which the schools are to be held and the dates are as follows :—Casino (17th to 21st June), Grafton (15th to 19th July), Wauchope (29th July to 2nd August), Tamworth (12th to 16th August), Hexham (26th to 30th August), Wagga Wagga (9th to 13th September), Bega (16th to 20th September), Moss Vale (30th September to 4th October).

Applications for attendance or for further particulars should be made to the Under Secretary, Department of Agriculture, Box 36A G.P.O., Sydney, or to the Director of Dairying, 25 O'Connell-street, Sydney.

Infection Experiments With Spores of Blue Mould Disease of Tobacco.

G. P. DARNELL-SMITH, D.Sc. (Syd.), B.Sc. (Lond.), B.Sc. (Brist.), F.I.C., F.C.S.,
Director of the Botanic Gardens, Sydney.

LARGE numbers of young tobacco plants have been kept under observation at the Botanic Gardens during the last few years, and observations have been made upon the mode of infection and production of the spores of blue mould. The more we know of the life-history of this fungus the more likely are we to arrive at methods of control.

Observant tobacco growers have pointed out to me a blue mould upon lucerne and a blue mould upon "Fat Hen," (*Chenopodium album*), and have suggested that tobacco may become infected from them, but careful measurements of the spores have demonstrated that these two moulds are distinct from each other and from that of tobacco, and it was not to be expected that the same fungus would grow upon such widely different hosts. The mould upon lucerne is *Peronospora trifoliorum*, and the mould upon "Fat Hen" is a *Peronospora*, which is certainly distinct from *P. hyoscyami*. The blue mould disease of tobacco has been known for many years as *Peronospora hyoscyami*, but it may not be identical with this fungus.

Numbers of infection experiments with the spores of blue mould have been carried out upon plants grown in sterile sand, in sterile pots, and watered with sterile nutrient solution. It has been observed :—

(1) That the spores germinate, under suitable conditions, within twenty-four hours.

(2) That they produce a strong germ tube which enters by the leaf pores.

(3) That, having entered the leaf, a large number of hyphæ are produced in the tissues.

(4) That, within eight or nine days, a fresh crop of spores may be produced from the infected leaf.

(5) That a tobacco plant in its very youngest stages, *viz.*, when it has the first two seed leaves, may become infected with blue mould. This is of importance, since I have shown* that when once a tobacco plant is infected with blue mould it may be attacked by *Bacterium solanacearum*. The gum pockets frequently found in the stems of plants infected with blue mould are doubtless connected with bacterial infection.

(6) That a plant once infected with blue mould is always a potential source of infection, for example, an infected plant kept in an isolated bush-house produced a crop of spores in November, another crop in the following March, and a third crop in the following November.

* Preliminary Investigations on a Bacterial Disease of Tobacco. G. P. Darnell-Smith. *Journ. Roy. Soc.*, N.S.W., Vol. LII, 1918.

(7) Provided it is not subjected to very cold weather, a tobacco plant may last for two years.

(8) Plants raised from the seed of White Stem Orinoco, Cash, and Warne, imported from Virginia, U.S.A., where blue mould disease is unknown, were found to be liable to infection, as was also the native tobacco plant (*Nicotiana suaveolens*), but in the case of infection experiments carried out with the allied plants, *Solanum pseudo-capsicum*, and *Solanum sodomæum*, negative results were obtained. A *Nicotiana* from Lord Howe Island, which is closely allied to *Nicotiana suaveolens*, was found to be liable to infection.

Unit Values of Fertilising Materials.

The unit values of fertilising ingredients in different manures for 1929 are as follows :—

	Per unit. s.	d.
Nitrogen in nitrates	21	10
,, ammonium salts	16	6
,, blood bones, offal, &c.	18	3
Phosphoric acid in bones, offal, &c.	5	1
,, (water souble) in superphosphate	5	2
Potash in sulphate of potash	6	7

To determine the value of any manure, the percentage of each ingredient is multiplied by the unit value assigned above to that ingredient, the result being the value per ton of that substance in the manure. For example, a bonedust contains 4 per cent. nitrogen and 20 per cent. phosphoric acid :—

4 × 18s. 3d. = £3 13s. 0d. = value of the nitrogen per ton.
20 × 5s. 1d. = £5 1s. 8d. = ,, ,, phosphoric acid per ton

£8 14s 8d. = value of manure per ton

It must be clearly understood that the value thus assigned, depending solely upon the chemical composition of the manure, does not represent in all cases the actual money value of the manure, which depends upon a variety of causes other than the composition, and is affected by local conditions; neither does it represent the costs incurred by the manufacturer in the preparation, such as cost of mixing, bagging, labelling, &c. It is simply intended as a standard by which different products may be compared. At the same time it has been attempted to make the standard indicate as nearly as possible the fair retail value of the manurial ingredients, and it will be found in the majority of cases the price asked and the value assigned are fairly close.

It will be noted that the unit values show a slight decrease compared with values obtaining in 1928, the principal reduction being in superphosphate. The reductions for nitrogen are (*a*) as nitrate, 0·8 per cent.; (*b*) as ammonium salts, 4·4 per cent.; (*c*) as bone, &c., 3·5 per cent. For phosphoric acid (*a*) water-soluble, 8·8 per cent; (*b*) bone and bone products, 3·2 per cent.; and for potash, 1·3 per cent.

The unit value of water-soluble phosphoric acid is only 1d. more than that of phosphoric acid in the form of bone. The unit value of nitrogen in bone is 1s. 9d. more than that of nitrogen in the form of ammonium salts.—A. A. Ramsay, Chief Chemist.

Cool Storage of Fruit.

Report by Mr. H. Broadfoot on the Victorian Systems.

The lack of reliable information from unprejudiced sources on the problems of cool storage of fruit moved the Department of Agriculture to authorise Mr. H. Broadfoot, Special Fruit Instructor, to visit Victoria and report on the cool storage systems used in that State. His full report, of which the article below is a condensation, has already been made available to interested bodies, including representatives of the fruit-growing interests of the State. This summary, although necessarily omitting much of the detail contained in the full report, should prove valuable to those contemplating the erection of a cool store.

Systems of Refrigeration Used in Victoria.

Practically only two systems of cool storage are in use in Victoria, namely, the air circulating system and the direct expansion system. In deciding which system it is best to adopt, the purpose for which the store is intended and its capacity must be taken into account. If only a small store is needed the direct expansion system is recommended as the cost is less, and the overseer has more time to attend to other duties than he would have were he running a cool store on the air circulating system.

Merits and Demerits of the Two Systems.

Under the direct expansion system air does not pass from one chamber to another, this being a big advantage when the store is intended to preserve a wide range of fruit, such as oranges, apricots and other odorous fruits, together with apples and pears. It is highly probable that the only locality in New South Wales where the direct expansion system would be an advantage is the Murrumbidgee Irrigation Area, the great majority of our other fruit districts being distinctly apple and pear, or citrus districts. Apples, pears, peaches, plums, prunes and grapes may be stored in the one building. Again, air humidity in the chambers was found to be satisfactory under the direct expansion system, whereas in the case of the air circulating system it was found necessary to control it.

As regards the advantages of the air circulating system as compared with the direct expansion system, the air can be cooled down more rapidly under the former system, and the warm air drawn out of the chambers is replaced by cold air, whereas, in the case of the direct expansion system the air remains more nearly stationary. The ventilation is better and there is less danger of the air becoming musty and of carbon-dioxide accumulating. The forced air circulation prevents these defects, the air circulating system being inherently better in that respect.

In Victoria about 80 per cent. of the cool stores are operated under the air circulating system, which has been found most suitable for the storage of apples and pears. Although investigations are proceeding regarding the storage of citrus and stone fruits (peaches principally), no definite findings

have yet been arrived at apart from proving that certain varieties of peaches and plums will keep in cold storage for fairly long periods, while other valuable commercial varieties will not store satisfactorily.

To summarise the merits and demerits of the two systems, it might be said that the direct expansion system is perhaps very convenient for small stores, and is more suitable for the storage of several kinds of fruits which include odorous fruits, while the air circulating system is perhaps better in the case of larger cool store where one or more kinds of fruit are handled, and whose odours are not likely to cause trouble.

Points in Selection of Plant.

The refrigerating plant is of such great importance that it is unwise to decide upon purchase except with the advice and assistance of a qualified engineer. When installing the plant, future as well as present demands should be taken into consideration.

Another important point to bear in mind is the source of motive power. In Victoria the powers chiefly used are: (*a*) Crude oil, (*b*) suction gas, and (*c*) electricity. In this connection, availability, price, transport of fuel, reliability, simplicity, effectiveness and renewal of parts have to be taken into account. However, the chief consideration is the efficient and economical running of the plant and factors which are likely to affect these operations are as follows:—

(*a*) The amount of fruit to be cooled.

(*b*) The insulating properties of walls, ceilings and floors of the cold store, and of the material used for insulating these. The heat transmitted by walls, ceilings and floors depends upon the area of the surfaces and the mean difference in temperature inside and outside the cool chambers. This latter point is almost beyond control, but may be influenced somewhat by choice of site for the building.

Packed insulating material, however carefully filled in, will always settle and leave an air space at the top, particularly in the walls. In time this will cause condensation and wetting of the insulating material. Provision, therefore, should be made during the building of the store to enable this space to be refilled with insulating material whenever required.

The greater the capacity the less, relatively, is the area of the transmitting surface. A big cool store will have better thermal efficiency than a small store, and a building whose ground plan is square will have a smaller transmitting surface than a building of the same capacity but having an oblong ground plan, provided, of course, the wall height is equal in both cases.

(*c*) The condition of the compressor and expansion systems. The defects most commonly encountered are leaky pistons or leaky valves in the compressor, insufficient ammonia in the system, leak in the ammonia piping system and valves, collection of liquid ammonia in expansion system at low-lying points, piping and valves with no lagging or with insufficient lagging.

(*d*) The quantity of cooling water available and its temperature. The condenser should be elevated and enclosed in a wooden structure so designed and built that wind blows freely through it and evaporates the water, evaporation being the underlying principle of refrigeration, and the more rapid the evaporation the lower the resulting temperature.

(*e*) The amount of condenser pipe available. This should be not less than 100 feet to the ton of refrigeration in use, and the condenser water should be applied to the piping so that the whole surface is thoroughly wetted.

(*f*) The amount of ammonia in the system. The compressor cannot do its work satisfactorily if the amount of ammonia in the system is insufficient, and, therefore, the system should be purged of air repeatedly.

(*g*) The manner in which the plant is operated. Fruit should be placed in the store as early as possible in the morning, as it is then generally low in temperature. Doors of the chambers should not be opened after 12 noon.

(*h*) The density of the brine. The brine is continually weakening owing to the absorption of atmospheric moisture, and it is very essential that its specific gravity should be 1·150 at a temperature of approximately 60 deg. Fah. An ordinary car battery hydrometer is very suitable for testing the density of the brine. Frosting on the coils will take place if the specific gravity is allowed to fall, and as ice forms an insulating material, loss of efficiency results.

(*i*) The condition of all joints in the ammonia system.

(*j*) The capacity to which the store is filled. The greater the quantity of fruit the easier it is to maintain the desired temperature.

(*k*) The frequency and the length of time cooling chamber doors are opened. Every time a cool chamber door is opened there results a rise of temperature in the cool chambers.

(*l*) The heat generated by micro-organisms in decaying fruit.

(*m*) The atmospheric conditions prevailing in the locality in which the cool store exists. It is impossible to control this factor.

(*n*) The lighting conditions of the store. Electricity is the best form of lighting. Whatever form of lighting is used the lamps should not be burned more than is necessary, otherwise the temperature is increased.

Suitable Timbers and Insulating Material.

Hardwoods in general use for constructional work will be found suitable for the building of cool stores. Baltic pine lining for the chambers and hardwood flooring are recommended, while corrugated iron is suitable for roofing. Keep the building well off the ground as this reduces the risk of dry rot affecting the timber, particularly where Oregon pine is used.

The insulating materials most commonly used are softwood buzzer chips, cork slabs, pumice, charcoal and granulated cork. The charcoal is not recommended, being considered liable to spontaneous combustion, while the fire insurance rates on buildings insulated with this material are heavy.

Buzzer chips are mostly favoured for wood buildings, being reasonable in cost and making a highly satisfactory job. They should not be used unless thoroughly dry and they must be packed tightly. Cork slabs are preferred in the case of brick or concrete buildings, as neither moisture, heat, nor cold affects it.

Cost of Establishing Cool Stores.

Exclusive of cost of site, the approximate cost of establishing stores of various capacities under the air circulating system was found to be, as follows :—A store of 11,000 cases capacity costs £7,530 (building, £5,500; plant and motor, £2,030); one of 15,000 cases capacity, £10,250 (building, £8,000; plant and electric motor, £2,250); one of 20,000 cases capacity £12,550 (building, £10,000; plant and electric motor, £2,550). In each case 25 per cent. must be added to cost of plant and motor if a crude oil engine is installed. The plant costed above provides for 25 to 50 per cent. more space than specified, and the only additional cost necessary to effect this expansion would be that of extending the building.

Running Costs.

The matter of running costs was gone into, and it was found that there was practically no difference in the running costs of large stores whether run under air circulating or direct expansion systems. In the case of a 20,000 cases capacity store of four chambers at Somerville, Victoria, working nine and a half months of the year and operated under the air circulating system with a 30 h.p. electric motor and 5 h.p. engine driving the fans, pumps, &c., fruit was stored at a cost of 7½d. per case. Another air circulating system store at Red Hill having a capacity of 22,000 cases with eleven chambers and operated by a 80 h.p. crude oil engine estimated the cost per case at 6½d.

In the case of two direct expansion system cool stores operating in Victoria, one having a capacity of 15,000 cases and the other 10,000 cases, the cost per case ran out at 7½d. and 6d., respectively. The former store had four chambers and was operating for ten and a half months of the year, a 34 h.p. crude oil engine being used. The latter store had three chambers, was operated for the same number of months in the year, and used a 32 h.p. crude oil engine.

In all the foregoing costs interest on capital is not taken into account.

Cool Store Appointments.

Thermometers.—Each chamber should be provided with at least one thermometer, and frequent readings should be taken. Two to each chamber is perhaps a better arrangement, one being placed at the inlet and the other at the outlet duct.

In the Victorian cold stores two types of thermometers are used—the mercury thermometer and an electrical instrument, popularly known as the "long distance" thermometer. Mercury thermometers are not always accurately constructed and are sometimes difficult to read. Moreover, in

the case of the mercury thermometer it is necessary to enter the chamber every time a reading is taken. In the case of the electrical instrument temperatures can be read in the compressor room or any other convenient place without entering the chamber, consequently without disturbing its temperature. Moreover, this type of thermometer is a distinct saver of time, particularly in cool stores having a large number of chambers.

Trolleys.—A strong serviceable trolley is a necessity. One about 6 feet long and 1½ feet wide will be found a convenient size. It can be run on four wheels, a wheel being placed at each end and two in the centre—the end wheels are set higher than the centre wheels. A trolley of this size will carry about twenty cases. The trolly wheels should be rubber tyred as this saves the fruit and the floors and minimises the noise nuisance.

Conveyors.—Gravity conveyors greatly reduce the labour of handling fruit. There are two types—the roller and the wheel type. The latter is regarded as the better, although the former has always given satisfaction.

Doors.—In Victoria, sliding and swinging doors are commonly used They should be well insulated and be so constructed as to be absolutely air-tight when closed. Sliding doors are most convenient for partition walls.

Humidity.

About 80 degrees humidity is considered very suitable for fruit, being dry enough to keep down mould development and moist enough to keep the fruit from wilting. When fruit is first stored the humidity may be as high a 95 degrees, but should be reduced as quickly as possible.

The humidity in direct expansion chambers is generally satisfactory, but under the air circulating system the humidity must be regulated. This can be done by regulating the brine density, for if it is allowed to become too concentrated the air becomes too dry and shrivelling of the fruit follows. The following densities of calcium chloride brine have proved satisfactory :—

When fruit is first placed in storage	1·132
After a few days in storage...	1·150

For measuring air humidities when air temperature is under 32 deg. Fah. the sling psychrometer is one of the best instruments available; where the air temperature exceeds 32 deg. Fah. the wet and dry bulb thermometer is quite satisfactory. Another instrument for measuring humidity is the Negrette and Zambras' improved hygroscope, being used in the Batlow cool stores.

Sizes of Chambers.

The chambers in a cool store run under the air circulating system can be much wider than where the direct expansion system is in use, that is, when the coils in the direct expansion chambers are placed on the walls. If the direct expansion chambers are too wide it is difficult to reduce the temperature of the air in the centre of the room as there is no forced air draught as under the other system. If the width of direct expansion chambers proves to be

too great, the difficulty can be overcome by placing a set of coils on the ceiling or on the posts. The placing of coils in cool chambers intended for fruit, however, is generally on the walls, not on the ceilings. For fruit storage, pipes whose internal diameter is 1¼ inches are recommended, one foot of piping being required for every 5 cubic feet of space. The pipes should be placed 2 inches from the walls and as high up on the wall as possible.

Delivery of Air into Air-circulating Chambers.

The temperatures in the different chambers are regulated by the opening and closing of vents in ducts. In the more modern buildings, air travels along the ducts and is delivered into the chambers through a false ceiling known as the Madison Cooper ceiling. This ensures better circulation of the air and a more uniform temperature.

Shutters regulate the air current through vent openings and consequently regulate the temperature in the chamber. Warm air is drawn from the chambers through ducts and cooled again. Brine sometimes gains access to the chambers along with the air, but this trouble can be reduced to a minimum by keeping the brine at the correct density and by placing baffles or a brine eliminator at the delivery end of the battery.

Factors Affecting Keeping Quality of Stored Fruit.

Picking at the right stage of maturity is absolutely essential if the best results are to be achieved. Exactly what is the right stage of maturity has not yet been determined for all kinds of fruit. Fruit to be stored successfully should be of suitable variety, of normal size, grown on trees under good conditions in suitable soil, picked carefully at the right stage of maturity, and packed and transported with every care. Neglect of any of the foregoing conditions affects the storage life of fruit. Even when the whole of these conditions have been fully met, other factors, such as heavy rain immediately preceding picking, may detrimentally affect the storage life of the fruit, Thus, in a wet season, careful watch should be kept on the fruit in the store. It is recommended by some that in such a season the temperature in the cool chambers should be maintained slightly higher than in seasons with normal rainfall.

The information at present available concerning the keeping quality, &c., of the different commercial varieties of fruits is given below :—

Apples.—

Jonathan : A good storer if picked when well coloured. Large fruit goes "sleepy" if held any length of time. Jonathan spot causes losses and should be closely watched. This variety does not scald to any extent.

London Pippin : Holds until November if picked when the ground colour is changing and placed in store straight from tree.

King David: Stores well in some seasons, but not a very sound variety to rely upon.

Delicious: If picked when well coloured and placed in store straight from the tree it will hold up well till October and November. Flavour improves in store.

Tasma: A splendid storer, which keeps well till the last, except oversized fruit from young trees, which goes "sleepy."

Yates: A splendid storer, which keeps to the last.

Dougherty: Stores well sometimes, but not a very sound variety.

Granny Smith: The general practice is to pick this variety in April and leave in well-ventilated stacks until June, by which time the skin develops an oily feeling. The fruit is then wrapped in oiled paper and placed in store. It holds well till December. This variety should never be stored except in oiled wrappers, otherwise scald is liable to develop when the fruit is removed from the store.

Rome Beauty: Stores satisfactorily when well coloured, but should not be held too long.

Rokewoods and Graftons: Both store very well.

Stayman Winesap: Goes "sleepy" if held too long and consequently should be cleaned up by the end of July.

For long storage, apples and pears should be picked at the right stage for the variety and after being allowed to cool down overnight placed straight into cool store. Delayed storage is satisfactory only as regards the Granny Smith and is fairly satisfactory for the Tasma, although the latter will hold longer if put straight into the store after picking.

Pears.—

W.B.C. (Williams'): Stores well for one or two months, but is risky beyond that time.

Packham's: One of the best storers, but should have a tinge of yellow before picking and should go straight into the store.

Winter Cole: One of the best storers, but should go straight into the store from the tree if intended to hold for long.

Josephines: Ripen quickly when they start and consequently should be closely watched. A very good storer.

Winter Nelis: Very good storer.

Howell: Liable to skin blackening on removal.

Buerre de Capiamont: Hardly worth holding.

Beurre Bose: Holds well for short storings.

Glou Morceau: A tender skin variety, holds well, liable to blackening or marking after removal from store.

Plums.—Although the time of picking plums is not so important as in the case of peaches, they should not be picked too early. A slightly acid taste

seems best to define this condition. President is the most satisfactory storer while Grand Duke and Pond's and, in fact, most European plums will hold well for short storage—three or four weeks.

Peaches.—Picking at the correct time is a most important factor. Some varieties of peaches are characterised by a definite ridge, which is the first portion to become soft at ripening. Such a variety should be picked about a day prior to softening, which stage should be judged by the eye and not tested by pressure.

Stacking and Ventilation.

Stacked cases must be so arranged that air will circulate freely among them, thus avoiding the presence of dead-air pockets. Generally speaking, a space of at least 2 inches wide should be left between the stacked cases and the chamber walls. Tiers of cases are placed about 1½ inches apart and the cases arranged so as to overlap in such a manner that air freely enters each box. Some stores have the floors battened, others have the walls battened, and some have both. Cases in the stores can be stacked up to within about 9 inches of the ceiling.

In direct expansion rooms care must be taken not to stack close to the coils or to arrange the stacks in such a manner that they will imprison the air. Flowing air, like water, follows the line of least resistance and when it enters a chamber it flows along the passageway unchecked, and does not readily percolate through the stacks. In this connection, a suggestion has been made that baffles should be placed in the cool chamber passageways. These baffles may consist of a light frame covered with some kind of light wood and are placed in a vertical position, they retard the air current along the passages and increase the flow of air through the cases, thus helping to keep the air at a uniform temperature.

Temperatures for Different Fruits.

In most Victorian stores the temperature considered most suitable for apples is 33 deg. Fah., for pears 32 deg. Fah., for peaches 36 deg., and for citrus 38 deg. Although it is considered advisable to run pears at a lower temperature than apples this is not practicable always, and where the staple product handled by the store is apples, pears are kept at the same temperature as the apples and very good results follow. In a store handling large quantities of both apples and pears it would be an advantage to have separate chambers, each run at the most suitable temperature for the fruit it contains.

Generally speaking, the prompt transference of fruit from tree to store is recommended, and the fruit should be pulled during the cool of the day, or, if this is not practicable, should be kept in the shade as much as possible. Another point of importance is where, say, certain of the chambers in the air circulating system have been filled and cooled down and later another chamber is loaded and has to be cooled. In such cases difficulty will be

experienced in reducing the temperature of this last chamber unless the ports in the lower temperture chambers are kept closed until the temperatures in all chambers are approximately equal, when all can be operated in common.

The flow, speed and distribution of air are important matters for consideration in each set of cool chambers. The easier its path is made in the air trunks the more efficient will be its work. If there are any obstructions a certain amount of air compression will result and this will have the effect of squeezing the water from the air and causing it to be deposited in the air trunks. This is highly undesirable.

Diseases, &c., of Fruit in Storage.

Soft Scald.—This is a physiological trouble common of Jonathan and Rome Beauty apples. It is often called Jonathan scald. It is greatly increased by delayed storge.

Scald.—This is easily the most serious defect that develops on apples in cold storage. In New South Wales, Granny Smith is most susceptible. It has been proved by experiment that immature fruit is very susceptible and that scald is more serious at high than low temperatures. Enclosing Granny Smith apples in oiled wrappers renders them practically immune.

Blackening.—Some varieties of pears, especially Keiffer and Howells, are highly susceptible. The trouble is minimised by storing at the right stage of maturity. Susceptibility is greater when the pears are stored at a high rather than a low temperature.

Bitter Pit.—Picking apples when immature favours the development of this trouble.

Skin Shrivel.—This is more likely to occur under the air circulating system, but only when the air has been allowed to become too dry.

Freezing.—The cause of this trouble is obvious.

Flesh Collapse.—Caused chiefly by over-maturity when stored. Fluctuation in temperature is another cause. Large fruit and fruit picked just after heavy rain are also susceptible.

Jonathan Spot.—This trouble characterises fruit that has been allowed to ripen too much before storage.

Moulds.—These gain entrance through skin abrasions, and careful handling, therefore, is the chief preventive.

The foregoing deals with the common storage troubles of apples and pears in connection with which definite recommendations can be made. Some investigational work has been carried out with citrus and stone fruits, but has not proceeded far enough to justify the making of definite recommendations. except that it may be stated that careful picking at the right stage of maturity and careful handling are absolutely essential. Citrus fruits should be sweated before storage, the sweating period varying from three to fourteen days.

Pruning Trials, 1925-27.

THREE YEARS' RESULTS AT ORANGE.

W. LE GAY BRERETON, Chief Fruit Instructor, and D. D. ATKINS, Fruit Inspector.

THE pruning tests at Mr. Sampson's orchard, Pinnacle-road, Orange, were commenced in the pruning season of 1925. The notes hereunder are from the results of three years' pruning—1925, 1926, and 1927.

The following varieties were available in this orchard:—

Pears: Howell, Williams', Packham's Triumph, Beurre Bosc, Winter Cole.
Apples: Granny Smith, Delicious, Jonathan, Fameuse.
Plums: President, Grand Duke, Angelina Burdett.
Cherries: Florence, St. Margaret, Early Lyons.

In most cases, with exception of cherries, three trees were included in each plot, trees being chosen which were even in size and vigour as far as possible, and in most cases there were three plots to each variety. A greater number of trees to each plot would probably be more satisfactory, but sufficient time could not be given to attend to more extensive plots.

The Aims of the Trials.

In regard to apples and pears, the main object of the tests was to determine (*a*) the best treatment of yearling laterals of the above varieties to promote fruit spurs in desirable positions, and (*b*) to determine the best treatment of such laterals in their second and subsequent years.

(*a*) The yearling lateral is the more simple problem, for, though more than one type of yearling lateral can be found on almost any variety, a certain type in most varieties will predominate on a variety in a certain locality. The results recorded in this article outline the behaviour of the predominating type of yearling laterals under the different treatments.

(*b*) Presents more difficulty, because to judge spur development during the third year one must have some record of the spur development already made on the two-year-old lateral. This was done by marking a number of two-year-old laterals with a numbered metal tag, and then recording in a notebook the spur development on each and treatment given.

On two-year-old laterals fruit spurs are to be found in various stages of development, and to facilitate recording these certain definitions were adopted which served the purpose, though they may not be botanically correct. A fully developed fruit spur was termed "fruit spur," while a partially developed fruit spur was termed "partial spur." When an eye had made some development, but not sufficient to be termed a partial spur, it was termed a "bud." When there was no development after it was formed it was called an "eye." The cluster of ill-defined or partially blind eyes often found just above the junction of two seasons' wood was termed "cluster eyes," and the term "cut just above junction" or "at cluster

eyes" means that the yearling extension of a two-year-old lateral is cut so as to leave no well defined or developed eyes above the cluster eyes. These can be followed for two seasons, but after that they become too complicated; therefore a fresh lot should be marked each season. This was discovered when taking the results in 1927 of the 1926 pruning.

Trials with Pears.

Howell.—(*a*) In the case of the yearling laterals the following treatments were adopted:—(1) On three trees, yearling laterals not cut; (2) three trees, yearling laterals cut back about two-thirds; and (3) three trees, yearling laterals stubbed hard back to weak cluster eyes near base.

This variety develops fruit spurs very readily, but though No. (1) treatment resulted in abundant fruit spurs, they were not developed so close to the base as when cut as in No. (2); moreover, many of the yearling laterals are very long, and fruit forming near the end of them is injured by whipping about in the wind.

No. (2) treatment is far superior to No. (1), but none of the laterals should be left longer than 7 to 8 inches.

No. (3) treatment developed fruit spurs satisfactorily, but, owing to the shorter length, fewer in number per lateral than No. (2), hence No. (2) treatment would be preferable in young trees when it is desired to develop fruit spurs rapidly. There is an indication that the stubbing back of the laterals, as in No. (3), has a stunting effect on the general growth of the tree.

(*b*) Regarding the treatment of second year and older laterals, clusters of spurs developed just below the cut when the yearling extension was removed from the two-year-old lateral at cluster eyes just above the junction of the two-year-old and yearling wood. When a length of yearling extension was left, carrying three or four definite eyes, greater growth ensued. The fruit spur, partial spur, and bud development was satisfactory under both treatments of the two-year-old lateral.

Williams'.—(*a*) The treatment of yearling laterals was as follows:—(1) On three trees, yearling laterals cut to from 5 to 6 inches; (2) three trees, yearling laterals cut to cluster eyes at base about 1½ to 2 inches; and (3) three trees, yearling laterals left full length.

This variety varies in its habit of spur development in different districts; moreover, though a certain habit of spur development may be general in a certain locality, odd trees can sometimes be found with a distinctly different habit.

In No. (1) treatment 5 to 6 inches was rather too long; where given about 3 inches the same development of fruit spurs occurred, but were closer to the base of the lateral.

With No. (2) treatment more fruit spurs resulted in the first year than from treatment (1), but in the second year yearling laterals so treated were not so satisfactory.

In the case of No. (3) treatment, a greater number of fruit spurs were formed than under either Nos. (1) or (2) treatment, but in most cases they were right at the extremity of the lateral, and even when the development on some laterals extended farther towards the base, they showed a greater length of bare wood at the base of the lateral than when treated as in No. (2). Fruit carried on the end of long laterals is liable to be injured during periods of heavy winds; moreover, it is difficult to eliminate these long pieces of bare wood by subsequent pruning.

(*b*) Two-year-old laterals show better development of fruit spurs when the yearling extension is removed at cluster eyes than when a length of the yearling extension carrying well developed eyes is left.

Beurre Bosc.—(*a*) Yearling laterals were treated as follows:—(1) On three trees, yearling laterals cut to from 5 to 6 inches; (2) three trees, yearling laterals not cut; and (3) three trees, yearling laterals stubbed back to cluster eyes at base.

No. (1) treatment showed more rapid fruit spur development than the closer cut of No. (3) treatment, but leaves the space towards the base of the lateral bare.

No. (2) treatment showed more rapid spur development than No. (1) or No. (3) treatment, but generally this spur development was more in evidence towards the extremity of the lateral than when treated as in Nos. (1) and (3). Some yearling laterals develop spurs back towards the base satisfactorily, especially the rather stout short laterals not more than 4 or 5 inches long, and it is satisfactory to leave these short stout yearling laterals uncut. With this variety there is a greater liability for fruit spurs to develop nearer the base in later years of the lateral's existence, hence it is not so difficult to eliminate the bare wood in later years, and therefore No. (2) treatment is not so objectionable as the similar treatment in the case of the Williams' pear.

In No. (3) treatment, fruit spurs are slower in developing than under No. (1) treatment, but form in excellent position, and when carried out during the early part of tree's life, when the framework is being developed, ample spurs should be fully developed by the time the framework of the tree is sufficiently developed to carry a crop. Where this is not the case No. (1) or No. (2), or a combination of the two treatments, may be desirable.

(*b*) The following are the results of the treatment of the laterals in their second and subsequent years. When yearling extension from two-year lateral is removed at cluster eyes, partial spurs or fruit spurs often develop just below the cut or around the junction of the two seasons' woods, and there is a better development of fruit spurs on the old lateral.

Packham's Triumph.—(*a*) Yearling laterals were treated as follows:—(1) On three trees, yearling laterals not cut; (2) three trees, yearling laterals cut to from 5 to 6 inches; and (3) three trees, yearling laterals cut to from 3 to 4 inches. This last treatment was started only during the 1926 pruning.

No. (1) treatment made many spurs, but more space towards the base of the lateral remained bare than in No. (2).

In No. (2) treatment the spur development was satisfactory, and closer to the base of the lateral.

Spur development was slower in the case of No. (3) treatment than in No. (2). Spur development was more rapid on the lighter lateral than on the heavy ones.

Winter Cole.—(*a*) Yearling laterals received the following treatments:—(1) On one tree, yearling laterals cut to from 5 to 6 inches; (2) one tree, yearling laterals stubbed back 0 to ¾ inch; (3) one tree, yearling laterals cut to from 2 to 2½ inches; (4) one tree, treatment same as (3), except that some yearling laterals were left uncut.

Owing to trees receiving (1), (2), and (3) treatments being in too wet a position to prune during the second season, these treatments were transferred to fresh trees in the 1926 pruning season.

In No. (1) treatment the spurs at the extremities were more developed than in No. (3). However, the partially developed spurs nearer the base are difficult to develop further in subsequent prunings.

With No. (2) treatment, the first season's spur development was satisfactory, but the second season yearling laterals treated in this way developed shoots in place of spurs.

No. (3) treatment was satisfactory, though the spurs take two seasons to develop fully.

With No. (4) treatment, the long yearling laterals were left to take the growth and check the shortened laterals from running to growths. The long yearling laterals had no apparent influence.

(*b*) Tests to determine the best treatment of the laterals in their second and subsequent years demonstrated that the shortening of old laterals carrying starved-looking fruit or partial spurs, which are prevalent in this variety, did not very appreciably improve such spurs.

Trials with Apples.

Fameuse.—(*a*) Yearling laterals were submitted to the following treatments:—(1) On three trees, yearling laterals reduced by one-half to two-thirds; (2) three trees, yearling laterals not cut; and (3) three trees, yearling laterals cut 1½ to 2 inches.

The cut was too long in No. (1) treatment, the spur development being at the extremity of the lateral, and leaving too much bare space at the base.

No. (2) treatment was not satisfactory, as too much bare space is left at the base of the lateral.

With No. (3) treatment the spur development was more satisfactory than in any of the other treatments.

(*b*) The removal of the yearling extension from a two-year-old lateral at the cluster eyes tends to develop the spurs on the older part of the lateral, but where these are already well developed a short extension is quite satisfactory if desired.

Delicious.—(*a*) Yearling laterals of this variety were treated as follows:—(1) On three trees, yearling laterals not cut; (2) three trees, yearling laterals cut to from 5 to 6 inches; (3) three trees, yearling laterals cut to from 2 to 2½ inches.

No. (1) treatment was not satisfactory, as it leaves too much bare space at the base of the lateral.

No. (2) treatment was also unsatisfactory for the same reason.

With No. (3) treatment the spur development was the most satisfactory.

(*b*) Short extension to two-year-old laterals is quite satisfactory, if desired, otherwise the removal of the yearling extension at the cluster eyes assists in the development of fruit spurs on the older part of the lateral.

Granny Smith.—(*a*) The following treatments were given to yearling laterals:—(1) On three trees, yearling laterals cut 5 to 6 inches; (2) three trees, yearling laterals not cut; (3) three trees, yearling laterals cut 2 to 2½ inches.

No. (1) treatment was not so satisfactory as No. (3), because more bare space is left towards the base of the lateral.

No. (2) treatment was not satisfactory, because often the uncut lateral fails to spur except near the extremity, leaving too much bare space near the base.

No. (3) treatment was most satisfactory when cut up to 3 inches, and gave similar development of spurs to No. (1), but closer to the base of the lateral.

(*b*) Regarding the treatment of the laterals in the second and subsequent years, allowing a shorter extension to two-year-old laterals appeared to have the same effect on spur development on the older part of the lateral as removing the yearling extension at the cluster eyes.

Jonathan.— (*a*) Treatment of yearling laterals was as follows:—(1) On three trees, yearling laterals not cut; (2) three trees, yearling laterals tipped.

In both cases the laterals developed spurs satisfactorily.

Trials with Plums.

Angelina Burdett.—(*a*) Yearling laterals of this variety were treated as follows:—(1) On three trees, yearling laterals not cut; (2) three trees, yearling laterals cut.

No. (1) treatment showed good development of fruit spurs.

With No. (2) treatment, the first season's development of fruit spurs was not so good as with No. (1), while in the second season the yearling laterals shortened in this way developed fruit spurs nearly as well as No. (1).

Grand Duke.—(*a*) Yearling laterals were treated as follows:—(1) On three trees, yearling laterals not cut; (2) three trees, yearling laterals shortened by half to two-thirds.

No. (1) treatment gave good fruit spur development.

No. (2) treatment promoted fruit spur development that was quite satisfactory.

President.—(*a*) Yearling laterals were given three different treatments:—(1) On three trees, yearling laterals, with the exception of the very light ones, were shortened by half to two-thirds; very light yearling laterals were left full length because they very often die out if cut; (2) three trees, yearling laterals not cut; (3) two trees, yearling laterals stubbed to 1½ to 2 inches.

With No. (1) treatment the heavier laterals developed fruit spurs satisfactorily.

With No. (2) treatment the fruit spur development was satisfactory.

No. (3) treatment showed promise up to the 1927 pruning, but during the 1927-28 growing season there were indications of old laterals dying out.

(*b*) Pruning tests were carried out to determine the best treatment of the laterals in their second and subsequent years. The spurs of President plum trees, in common with several other varieties of plums, are very short lived, and hence the laterals rapidly become bare for some distance up from the base. In many other varieties of plums these can be fairly readily replaced, but with President replacing is attended with most erratic results. So far these tests have not revealed any method of overcoming this difficulty.

The following general note on the pruning of plums is of interest. When leaving the yearling laterals uncut it is important that only the light laterals be left, as when the stronger yearling laterals are left uncut they grow very strongly, and interfere with the main framework of the tree.

Trials with Cherries.

Early Lyons.—(*a*) Two trees treated. These were big trees, thirteen to fourteen years old, but had not carried a heavy crop of fruit up to 1925. They were headed back to old wood in the early spring of 1925, when the sap commenced to move, but before there was any shoot; from 4 to 6 feet of wood was taken from the top, and a few limbs were entirely removed. In 1924, at the same period of the year, one tree was treated as follows:—The yearling leaders were thinned out, not topped, while in some places old limbs were shortened back to strong laterals. Yearling laterals were not topped, but some yearling laterals were removed to cluster eyes at the base. The other tree was treated in the same way, except that yearling leaders and yearling laterals were topped.

The topping of yearling leaders and laterals or leaving them untopped apparently made no difference in the case of these trees. There was no dying off of yearling laterals, as often does occur in this variety.

(*b*) The removal of yearling extensions at cluster eyes from two-year-old laterals appeared to benefit spur development on the older part of the lateral.

Florence.—Two trees were treated in a similar manner to the two preceding Early Lyons variety.

Margaret.—Two trees were treated in a similar manner to the two preceding Early Lyons trees.

These Lyons, Florence, and Margaret cherry trees were about thirteen or fourteen years old, and had, up to 1925, never cropped satisfactorily. The heavy heading back to old wood was carried out partly to ascertain whether it would affect the cropping, and also because it was necessary to facilitate handling. It was Mr. Atkins' and my own opinions that it would have been advantageous the following season to have been more severe in the heading back to old wood in 1925. The heading back seems to have had little or no apparent effect on the fruit spurs in the lower part of the tree.

In 1926 this block of trees carried a very heavy crop. The two Lyons trees carried less fruit, but of greater size, which made their yield about equal to the neighbouring trees that were not headed back. The same applied to the Florence. But the two St. Margaret trees that were headed back only carried one box of cherries each, whereas the neighbouring trees carried from five to six boxes. The increase in size of fruit did not nearly make up for the lesser number of cherries on the St. Margaret trees. The reduction of number of cherries the first year after the heading back was not surprising, because the best developed fruit spurs were situated in the uppermost parts of the trees in all three varieties. But the following fruit season it was thought the headed-back trees might show to advantage. However, the 1926 crop was almost a complete failure throughout the block. Failure was variously attributed to thrip and late frosts. Some tests were also carried out on younger cherry trees.

St. Margaret.—(*a*) On two trees the yearling leaders were topped, leaving 6 to 7 inches annually. The yearling laterals of one of these trees were also topped, whereas on the other the yearling laterals were not cut. The fruit spur development was rather better on the cut than the uncut laterals.

(*b*) The removal of the yearling extension at the cluster eyes did not appear to influence the spur development on the older wood.

St. Margaret.—(*a*) On two trees the yearling leaders were topped back to cluster eyes at the base every alternate year. The new leaders started sometimes from the cluster eyes at base, but often from below, leaving a dead stub.

(*b*) See note above.

Florence.—(*a*) Four trees received the same treatments as in the two preceding tests with St. Margaret. There was no apparent difference in the results obtained from the various treatments of the leaders. The cut yearling laterals both in the St. Margaret and Florence varieties showed slightly better fruit spur development than when uncut.

(*b*) The removal of yearling extensions from two-year-old laterals assisted in the development of fruit spurs on the older part of the lateral. Two trees each of St. Margaret and Florence varieties had their leaders left untopped in alternate years, and in the intermediate years the leaders were shortened back to below the junction of the yearling and two-year-old leader. This is rather a common practice among Orange cherry growers. It allows the tree to commence to spur along the leader, and the cutting back in alternate years prevents too rapid extension in height. Also, two trees each of St. Margaret and Florence had their leaders left untopped each season. These cut and untopped leaders were started in 1926, and so far the result is promising.

General Observations.

Yearling laterals left uncut make a stronger growth than those cut, and where it is desired to leave yearling laterals uncut to encourage fruit spur development, only the lighter ones should be left. The strong laterals, if not required for the development of the framework of the tree, especially those springing from a main limb near the leaders, should be cut back to the poorly developed or almost blind eyes at their base, otherwise they may interfere with the development of the framework and become difficult to manage later on.

The cluster eyes at the base of yearling laterals of some varieties are completely blind, as in the Jonathan apple, and with such varieties the yearling lateral should not be cut so close, but more length given to ensure the inclusion of a live eye if the total removal would make the limb too bare. The topped yearling lateral often makes shoots from the two eyes nearest the terminal during the following growing season.

The practice which proved most satisfactory with all varieties of apples and pears in these tests, when it was desired to reduce the growth at the following pruning without reducing spur development at that time, was to remove the yearling terminal shoot or extension at the cluster eyes at its base, and to leave a short length of the yearling side shoot. During the following season in the majority of cases this second shoot developed one or more fruit spurs. On the other hand, if the two-year-old lateral was reduced back to the second yearling side shoot, the first fruit spur behind it developed into a shoot and was lost for the time being. However, in old laterals where the spurs appeared exhausted, this shortening back to a side shoot or spur proved useful in either forming new spurs or starting new shoots, which could be used to develop fruit spurs at a later stage.

In actual pruning practice it is quite common to find odd laterals missed by the pruner, even when he is following a "short cut" lateral system. Provided the pruner is not over slovenly in this respect a few missed laterals should be looked upon as a good rather than a bad point, as it is probable that these uncut laterals assist in counteracting the stunting effect of hard pruning. Indeed, when it is necessary to employ a severe pruning system it is wise purposely to leave some laterals uncut, care being taken that any strong laterals left in this way are in positions where there is no likelihood of their sapping the leaders of the tree.

Plant Introduction.

H. WENHOLZ, B.Sc.Agr., Director of Plant Breeding.

SEED and plant introduction is a phase of crop improvement which must always occupy the attention of a Department which is concerned with increasing agricultural production.

Australia, being a comparatively new country, and because of its more isolated position and the fact that, unlike many other important agricultural countries, it has no agricultural crop of any importance which is indigenous to the country, stands more definitely in need of a systematic policy of crop introduction than many older countries. All the chief cultivated farm, fruit and vegetable crops grown in Australia to-day had originally to be introduced from some other part of the world.

In the early colonising days, state governors were extremely active and interested in crop introduction, for the production of food was a vital question. Australian history records how shipments of foodstuffs came in time to save the population from starvation after a comparative crop failure. Even at this early stage, it was recognised that the best chance of success in plant introduction lay in turning more to those countries which had similar climatic conditions to those of Australia. Maize from Africa was, for instance, of much greater success than wheat from England in the coastal districts of New South Wales, to which area cultivation was then confined.

Lack of communication hampered this desirable plan of crop introduction for many years, but with increased communication private efforts also aided considerably in introducing valuable crop plants into Australia. For many years it was purely a question of crop introduction without any great regard for the variety or kind of crop, and it is really remarkable that so much of value was achieved in this way in a new country like Australia. It may be said that, in those times, there was a keen general interest in plant introduction. It was probably not until state departments of agriculture took a hand in the obviously important work of economic plant introduction that there was much discrimination as to the variety or kind of the crop introduced. Here again the counterparts of Australian climatic conditions in other countries were given still closer attention with more useful results. Much more rapid headway was made with this more expert handling of the work, and further progress in plant introduction has resulted from the greater specialisation in the important crops by the different state departments. The New South Wales Department of Agriculture has carried out this specialisation probably to a greater degree than any other state, by reason of the existence of a more extensive organisation within this Department, and it is on this account that much of the credit for comparatively recent valuable introductions can be laid at the door of this State.

Many Valuable Introductions.

The late William Farrer was one of the first in Australia to recognise the all important value of wheat introductions from India, Canada and other countries, for without these he could not have evolved Federation wheat, into the breeding of which Indian and Canadian wheats entered.

A systematic study of the climatic conditions of certain areas of New South Wales and their climatic counterparts in the United States led to the introduction and highly successful establishment of important maize varieties, such as Funk's Yellow Dent, Golden Glow and Early Morn.

Saccaline, Collier and White African sorghums are introductions which are far superior to the old Planters' Friend sorghum, which was the best yielding forage variety for many years in New South Wales.

Caloro and Colusa are introduced Californian varieties which have been quickly established in our comparatively new rice growing industry.

White Burley tobacco from America has been used by the Tobacco Expert of the Department as a parent with the local dark tobacco in breeding Dunbur, a superior variety for flue curing.

An enterprising local seedsman has introduced, within recent years, a garden pea, Greenfeast, which has literally swept practically every other variety out of commercial culture in New South Wales.

Superior varieties of forage crops, such as Purple and Woolly-podded vetches, White Stringless and Bush velvet beans, &c., and certain vegetable crops, such as Banana squash, Irish Grey watermelon, Early Fortune cucumber, &c., have also been introduced by the Department of Agriculture in recent years. To the New South Wales Department also belongs the credit of introducing, in comparatively recent years, Sudan and Kikuyu grasses from Africa, both of which have found a profitable place in the agriculture of many districts. A number of new fruit varieties of merit have also been brought to the State through the timely efforts of the Department.

Most of the valuable introductions mentioned above have been made through the alertness and specialised knowledge of crop specialists of the Department who have been continually on the lookout, when reading through the current literature of other countries, for any new variety of promise.

New Organisation for Plant Introduction Work.

With the establishment of the Plant Breeding Branch in 1927, the work of plant introduction has been put on a still more efficient and systematic basis. This branch is now specifically charged with the work of introducing seeds and plants in co-operation with the crop specialists of the Department, and is also responsible for the records relating thereto.

Plant introduction is of very considerable importance and interest to the plant breeder. A wide range of material in any crop must be studied to observe the varieties having the characters it is desired to combine into a single variety by cross-breeding. A plant breeder working on a particular

crop eventually acquires an even greater detailed knowledge of varieties than the crop specialist, and many varieties which are worthless to the crop specialist because of their direct unsuitability are highly prized by the plant breeder for some valuable character (in spite of many other defects) which may be made use of in breeding.

Obviously every variety or plant mentioned in the literature of other countries cannot be introduced, and discrimination has to be used in order that plant introduction may not prove difficult or uneconomically burdensome. Such discrimination is possible, in a marked degree, to crop specialists and plant breeders who are well versed in the variety characteristics of any particular crop and who are thus able largely to realise the particular merits of a new variety or its possibilities for use in breeding. These officers between them also have a complete knowledge of the different climatic conditions throughout the State, which is not only useful in determining the most likely sources in other countries of valuable material for introduction, but also in indicating in which parts of the State the new introduction is likely to succeed.

In seed or plant introduction Australia must be safeguarded against the entry of new injurious insects or diseases. In addition to the close observance of the Commonwealth quarantine regulations regarding seed and plant introduction, further provision is made for the fumigation of every parcel of seed or plants introduced into this State by the Department, examination by the Departmental Entomologist and Biologist, and subsequent planting under quarantine conditions in Sydney or on one of the experiment farms where they come under the close observation of one of the plant breeding staff during the whole period of growth and also under the notice of one of the Biologist's staff from time to time. Already some injurious diseases new to Australia have been detected through this vigilance and have been promptly suppressed.

Promising Recent Introductions.

During the comparatively short time the Plant Breeding Branch has been in existence and has had the plant introduction work of the Department specifically assigned to it, a large number of valuable or promising introductions of seeds and economic plants of all kinds have been made. A large and regular correspondence is now being maintained with individual workers on specific crops or with particular phases of improvement, such as disease resistance, &c., in certain crops in different parts of the United States, Canada, India, Russia, Germany, Hungary, Italy, South America, England, France, Africa, Japan, China, &c.

Plant introduction can be carried on more or less successfully between organised services, but when conducted between individuals who are mutually interested in a particular detail or phase of work with a certain crop, it is lifted from the ruck of routine to a measure of the greatest possible value. Such is the plan which has been most largely adopted by the Plant Breeding Branch in the work of plant introduction on behalf of the Department of

Agriculture in New South Wales. Probably a large share of the success of the Foreign Seed and Plant Introduction Service of the United States Department of Agriculture lies in their efficient organisation, backed up by the more expert advice of crop specialists and plant breeders. Plant introduction becomes a costly, inefficient, hit or miss routine work without such organisation and without such backing.

Cereals.

Early maturing wheats from some of the warmer-climate countries, such as India, Italy, North Africa, and Iraq, are of possible direct value for the drier parts of the State, and selections from these introductions in recent years have yielded varieties which, because of their comparatively quick maturing habits combined with productiveness (sometimes referred to as their drought resistance) give promise of extending the wheat belt farther west into drier parts. Many of these are being used further in cross-breeding to infuse some of their desirable characters into our wheats. Wheats which are highly resistant to rust, to flag smut, to bunt, to loose smut or other diseases, have been recently introduced by the Plant Breeding Branch from America. Africa, Germany, England, &c., and are to be used in breeding work.

Some early oats from America have already proved to be of promise for direct utilisation in parts of this State, and more promising selections have, in many cases, been made from them. Awnless oats from Russia, which are expected to be devoid of the factors tending to reversion to fatuoids and steriloids (a present drawback to our standard varieties in cultivation), are also considered to have great possibilities for use in breeding. Oat varieties resistant to loose and covered smuts, or to rust, have also been introduced for use by the plant breeder.

Many good barleys which have proved to be of direct value have been introduced from Algeria, and other varieties resistant to certain diseases, such as smut and leaf scorch, have been located in America.

The important rice industry is being served through recent promising introductions of larger grained varieties of better quality, which are the result of recent breeding and selection work on the rice experiment stations in Louisiana, California and Arkansas (U.S.A.), and Vercelli (Italy).

Superior or more promising linseed varieties have also been introduced from North Dakota, Wisconsin, India, Germany and Russia.

Fodder Crops, &c.

New sorghum varieties from America, India and Africa are under observation, and some promising lucernes have already come from Spain and South America.

A new field pea from U.S.A. is regarded as an introduction of outstanding merit, and some good new varieties of cowpeas, velvet beans and soybeans are also being watched with interest. Many new grasses and clovers are also being tested.

Sugar cane seed from cane breeders in British West Indies, Hawaii, Cuba and other tropical countries has been introduced for a large project in raising new seedling canes suitable for our northern rivers, and some new varieties of potatoes of promise from England, Germany, &c., are being tried out.

Fruit and Vegetable Crops.

Problems of mutual interest are engaging the attention of breeders of fruits and vegetables in New South Wales and other parts of the world, chiefly in U.S.A., and the personal communications regarding this work have resulted in many useful and promising introductions.

Some citrus species and varieties which are unknown here and which are reputed to be of high value in their own country are being introduced. New canning peaches, prune varieties, Japanese plums, cherries, grapes, strawberries, and passion fruit, which are reputed to have the desired characters we are seeking either for direct use or for use in breeding, are also coming in.

Tomatoes from Canada which are earlier than our standard commercial variety, Earliana, are already giving promising results. Wilt-resistant varieties have also shown promise and will be used further in breeding. French beans resistant to anthracnose or pod spot, sweet potato seed for raising new seedling varieties, new varieties of garden or canning peas, cabbage, cauliflower, carrot, parsnip, onion, lettuce, &c., and self-fertilised uniform strains of squash and garden beet from individual breeders of these crops are among the vegetable introductions which are expected to be of value.

Good Pasturing Methods Adopted by Scottish Farmers.

On several farms, as well as at the agricultural experiment stations in Scotland, a rotation and fertilisation system of handling pastures is followed. At the Kilmaruck Dairy School, sixty-five cows were pastured on 42 acres of grassland divided into seven fields of 6 acres each. The sixty-five cows were turned on one field and allowed to remain there for four days. Then they were turned on the next field for four days, and so on, until they had spent four days on each of the seven pastures. Every twenty-eight days they completed the rotation system. As soon as the cows were taken from each pasture it was harrowed with a springtooth harrow to scatter the droppings. Then it was given an application of commercial fertiliser. By this system of rotation the production of milk amounted to 5,000 lb. per acre as compared with the average of 1,000 lb. per acre under the ordinary method.

The rotation system made it possible to turn the cows on to the pasture earlier in the season and keep them on later than usual. The plan also provided a richer feed, since the short grass contains a high percentage of protein, more nearly comparable to the grain concentrates. The pasture furnished the entire ration for all cows except those that produced as much as 50 lb. milk per day.

Methods and Machinery for Top-dressing Pastures.

A. W. S. MOODIE, H.D.A., H.D.D., Assistant Agrostologist.

THE top-dressing of grazing land, although widely carried out in the older parts of the world, is a new practice to the majority of our farmers, and numerous inquiries are received by the Department for information on various phases of this work. The majority of inquirers state that they intend top-dressing natural pastures, and desire to know the correct fertilisers to use, the time to carry out the work, and the methods of application available. In this article an endeavour will be made to give particulars of the operations necessary for the efficient top-dressing of pastures for the benefit of farmers and graziers having no knowledge of what is entailed.

First of all it should be noted that top-dressing improves the pasture in the following ways:—(1) The quantity of feed is increased; (2) the quality of the feed is improved—more lime and phosphorus being supplied to stock by the fertilised plants and a greater amount of proteins being available on account of the increased growth of leguminous plants; (3) the amount of weed growth in the pasture is decreased; (4) palatable introduced grasses are encouraged, and gradually useful native grasses such as Wallaby (*Danthonia* spp.) and Panic (*Panicum* spp.) respond; (5) the grazing period is lengthened.

The Fertilisers to Use.

As a result of exhaustive trials carried out by the Department on private holdings, much valuable data has been obtained on this point, and for general top-dressing purposes, superphosphate (22 per cent. water-soluble phosphoric acid) as used for wheat, has proved to be the most beneficial. Other fertilisers supplying phosphoric acid, such as basic superphosphate and raw rock phosphate, cannot be recommended, as results, particularly from the latter, have been unsatisfactory. On the Northern Tablelands, basic superphosphate has proved useful in a few instances.

For the tablelands, slopes, Riverina, and similar districts, a top-dressing with superphosphate at from 84 lb. to 1 cwt. per acre will be found most economical. On the coast where different conditions prevail, and where paspalum is the dominating plant, the addition of a nitrogenous fertiliser to the superphosphate has been found to give better results than superphosphate alone, and a mixture of superphosphate 2 cwt. and sulphate of ammonia ½ cwt. per acre is recommended. On a pasture composed of winter grasses, 2 cwt. superphosphate should be used.

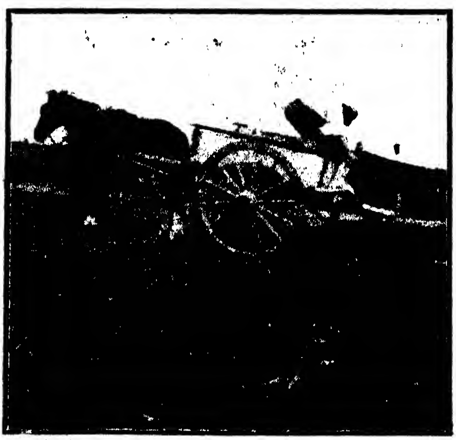
Time of Application.

The question of the correct time to apply the fertiliser is just as important as which fertiliser to use. For the tablelands and inland areas, autumn top-dressing should be carried out; on the coast winter pastures should be top-dressed in the autumn, and summer pastures (paspalum) in the late winter or early spring. Climatic conditions, as well as the predominant plants in the pasture, influence this question, and in cold districts an early application of the fertiliser is recommended, say, in February, in order to stimulate growth in the early autumn to ensure a good supply of winter feed.

The "Spreader" is Light of Draught, and Distributes the Fertiliser Evenly.

By top-dressing at the correct time, full benefit is obtained from the water-soluble plant-food in the superphosphate in the shortest possible time. Where the operation is carried out at the wrong time the effect is not usually apparent for some time, and is very gradual. This depends largely, however, on the rainfall following the application. No result will be observed from the top-dressing until rain falls and washes the fertiliser into the soil.

Sheep show a decided partiality for superphosphate, and after top-dressing a stocked paddock it is advisable to watch the stock closely, and if they appear to be licking up the fertiliser it might be advisable to remove them until rain falls. No anxiety need be felt regarding the health of the sheep, as the fertiliser should have no ill effects.



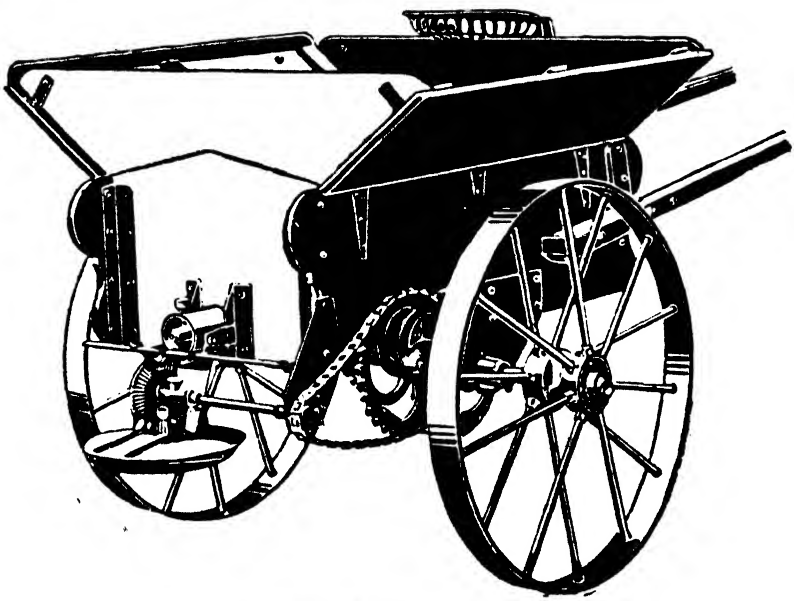
A "Broadcaster" Being Re-filled with Superphosphate.

Methods of Application and Machines Available.

Top-dressing can be carried out on any grassland over which it is possible to walk, machines having been designed to distribute fertiliser over every type of country. No treatment of the land in the way of ploughing or harrowing is necessary prior to top-dressing, although, on the coastal areas especially, harrowing to distribute the droppings and open up the surface

is strongly recommended. The pastures will respond to the manuring, however, whether harrowed or not.

In districts where mixed farming is practised the wheat drill is widely used for distributing fertiliser on the pastures, and on old cultivation land or well-cleared grassland this implement does good work. The usual practice is to remove the hoes or discs, allowing the tubes to swing, thus ensuring the broadcasting of the superphosphate. If an old drill is available it may be converted into a distributer by removing the whole of the undergear, discs (or hoes) and tubes, and allowing the fertiliser to drop straight from the box. Many of our progressive farmers commenced pasture top-dressing by using



A "Broadcaster" on its own Chassis.
A very suitable type for rough hilly country.

an improvised machine such as just described, but have been so impressed with the value of the practice that they have purchased one of the many specially designed machines. One disadvantage of the wheat drill as a top-dressing machine is the horse-power required to draw it compared with the special machines which are mostly drawn by a single horse.

Top-dressing machines are separated into two main groups, viz., (1) "broadcasters"; (2) "spreaders." In the former, the machine is usually designed to be attached to a dray, spring cart or motor lorry, the driving power being supplied from the wheel of the vehicle by a chain. Machines of this type are useful on rough, hilly country, or on heavily timbered land. The fertiliser is thrown from 15 to 25 feet on each side of the machine, and consequently it is not necessary to drive close to stumps or fallen timber to

distribute the manure. The wide distribution by these machines enables large areas to be covered daily—50 to 60 acres with a dray, and up to 120 acres with a motor lorry. The hoppers are constructed to hold a bag of fertiliser, and can be readily replenished from supplies carried on the dray or lorry.

The disadvantages of machines of this type are summed up by most landholders who have used them as follows:—

(1) They do not distribute as evenly as the "spreaders," due to the wide throw which may be influenced by wind, &c., and the fact that it is difficult to drive the vehicle so that the fertiliser will not be overlapped, or portions missed altogether. The spreader leaves wheel tracks on the grass, and it is easy to drive the machine to avoid overlapping or missing portions. A more granular type of superphosphate for use in "broadcasters" has recently been placed on the market, and will be found to minimise the effects of wind when using this machine. In chemical composition and effect it does not differ in any way from the ordinary superphosphate.

(2) Difficulty is often experienced with the chain drive when using a motor lorry, the chain having a tendency to fall off when the vehicle is on rough country. Theoretically this should not happen if the chain has been properly adjusted, but nevertheless this trouble has frequently caused comment.

The "spreaders" are designed on similar lines to the manure box of the wheat drill, the distribution being governed by "stars" or by an endless chain. These machines are complete, and drawn by one horse. The fertiliser is dropped directly on to the ground and is very evenly distributed. Adjustment of these machines for sowing at specified rates per acre is simple and accurate, and they are designed to sow from 28 lb. to 500 lb. per acre. Machines of this type do particularly good work, being especially adapted to well-cleared country, old cultivation land, &c. These machines usually have a spread of from 9 to 12 feet and 22 to 30 acres is considered a fair day's work.

The main points mentioned against this type of machine are—(1) They are more expensive than the "broadcasters"; (2) they will not cover the ground as quickly as the "broadcasters," and consequently the cost of distribution is increased; (3) more manure depots have to be established on large areas than for the "broadcaster." This last point is certainly a minor one, but has been mentioned by some graziers.

In addition to the abovementioned types, there are two implements worthy of special mention. For small areas, or for use on rocky country where a horse-drawn implement cannot be used, a hand machine has been designed that will effectively and accurately distribute the fertiliser. The bag holds up to 50 lb., and although there is no mechanical device to regulate the

quantities, the desired amount can be spread exactly with a little practice. It is claimed for this implement that on hill country up to 15 acres per day can be covered.

For large areas a "direct drop" machine has been evolved. This implement is attachable to a horse-drawn or motor lorry, spreads 16 feet, and will do up to 200 acres per day on clean country. It is really a combination of the "broadcaster" and the "spreader," covering large areas quickly as in the former type, and giving the accuracy of distribution and freedom from wind interference associated with the "spreader" types.

Cost is frequently the factor that influences the purchase of a machine, and it is well to bear in mind that a machine suitable for the prevailing conditions will prove most economical in the long run.

Hand Type of Distributer.
Suitable for rough hilly country and small farms.

The Cost of Top-dressing.

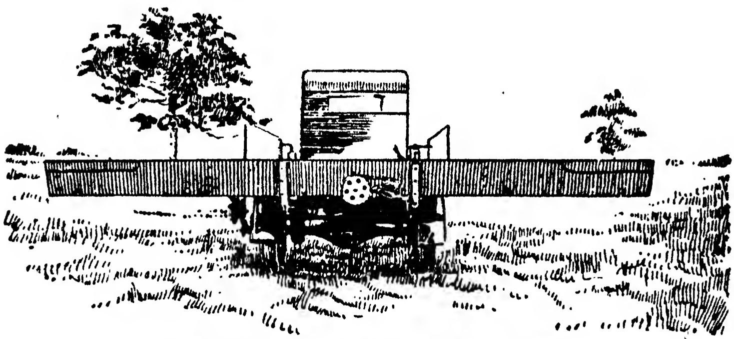
As farming to-day is a business, most landholders are anxious to have facts and figures regarding the cost of top-dressing their pastures, together with an estimate of the probable returns. The cost of the fertiliser and of its application is easily arrived at; the probable returns present a different proposition, depending so much on outside influences such as rainfall, soil, and the botanical covering of the pasture previous to top-dressing.

Under normal conditions trials carried out over the past three or four years prove conclusively that an increase in carrying capacity of up to 137 per cent. for two years may be expected, and that under favourable conditions as many as 3·6 sheep to the acre may be carried for the year as against 1·3 sheep per acre on unmanured land. In addition to the extra number of stock carried it will be found that those on top-dressed pasture fatten more readily and are less liable to disease than those on unmanured pasture.

Some pastures in long-settled districts where grazing has been carried on for a number of years and where the country has been badly rabbit-

infested, appear to be incapable of bringing stock to fat condition even where a generous area is allowed per sheep, but after top-dressing it is found possible to fatten stock readily and quickly.

What does this increase in carrying capacity cost ? The superphosphate, at the rate of 1 cwt. per acre, costs under 6s. per acre in most districts of the State, and to this must be added the cost of application—generally 8d. or 9d. per acre. On the coast where the rate of application is considerably heavier and where sulphate of ammonia is used in conjunction with the superphosphate the cost is 16s. to £1 per acre. These figures show the initial expenditure, but results from the top-dressing can be expected over a period of three years, and if the practice is carried out triennially the cost of application per annum works out at one-third of the cost given above. Top-dressing the pastures is surely a profitable and sound investment.



The "Direct Drop" Type of Fertiliser Distributer.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1929.

Forbes Sheep Show (K.O. Anderson)	July	10, 11
Narrandera Sheep Show (J. D. Newth)	"	16, 17
Peak Hill (R. H. Bentley) ...	"	23, 24
Cootamundra Sheep Show ...	"	24, 25
Young Sheep Show (T. A. Tester)	"	31, Aug. 1
Tullamore (S. Cameron ...	"	31, Aug. 1
Trundle (W. P. Forrest) ...	Aug.	6, 7
Gilgandra (G. Christie)	"	13, 14
Condobolin (J. M. Cooney) ...	"	13, 14
Illabo	"	14
Lake Cargelligo	"	20, 21
Wagga (F H. Croaker) ...	"	20, 21, 22
Bogan Gate (J. T. A'Beckett) ...	"	21
Junee (G. W. Scrivener) ...	"	27, 28
Grenfell	"	27, 28
Parkes (L. S. Seaborn)	"	27, 28
Ungarie	"	28
West Wyalong	Sept.	3, 4
Corowa (H. G. Norton)	Sept.	3, 4
Forbes (K. O. Anderson) ...	"	3, 4
Young (T. A Tester)	"	4, 5
Ganmain (C. C. Henderson) ...	"	10, 11
Cowra	"	10, 11
Barmedman	"	11
Canowindra	"	17, 18
Temora	"	17, 18, 19
Murrumburrah	"	24, 25
Barellan	"	25
Boorowa	"	26, 27
Ardlethan	Oct.	2
Quandialla	"	2
Narrandera (J. D. Newth) ...	"	8, 9
Manildra (P. Rubie)	"	8, 9
Ariah Park	"	9
Bribbaree	"	9
Griffith	"	15, 16
Carcoar	"	16
Cootamundra (R. D. Beaver) ...	"	22, 23

Barley.

A. H. E. McDONALD, H.D.A., Director of Agriculture.

The growing of barley has not proved popular with growers in this State, principally for the reason that, on the whole, more profitable returns have been obtained from wheat. With the fall in wheat prices during recent years, it may, however, be profitable for farmers to give some attention to barley growing.

For barley of good quality there is now a sound local demand at a price above that being paid for wheat, and where weather conditions are favourable for the production of barley better yields can be obtained. It is not deemed advisable for farmers to produce barley extensively, but the sowing of a comparatively small area of 40 to 50 acres should be worth while. Apart from the market for malting purposes, it is a basic feed for pigs, and on many farms in the wheat-growing districts, especially where there are good local markets, pig-raising is a profitable side-line. Should the barley, therefore, not be quite satisfactory for malting purposes, it can be used with profit for fattening porkers or baconers.

In the past, many farmers have been dissatisfied with their efforts to produce barley, but often this has been due to attempts to grow the crop under conditions which are not favourable. That the crop can be successfully grown by wheat-growers is shown by the fact that in South Australia and Victoria large quantities are produced, and most of our requirements come from those States. Such conditions should not be allowed to continue and our own farmers should at least try to supply the local market.

Barley should be grown in district with a comparatively good rainfall and with dry, bright conditions during the harvesting period. Only the lighter, well-drained soils should be cropped, low-lying areas being unsuitable, as barley does not tolerate wet ground. It should not be grown on rich land, owing to its liability to lodge under such conditions.

One objection farmers have to growing barley is that the seed is often left in the ground and barley comes up in succeeding wheat crops; while, on the other hand, the presence of wheat grain amongst the barley, coming from self-sown wheat, is an objection from the buyer's point of view, and some reduction in price may be made. A little management in cropping, however, will enable farmers to overcome both of these difficulties. Barley should preferably follow a crop that has been cut for hay. This will ensure that the land is free from wheat, and, provided the rainfall in the district is fairly favourable, the crop of barley will be quite satisfactory if the land is ploughed as soon as possible after the hay is taken off. The choice of such land for barley also tends to prevent lodging, which may occur in barley grown on fallowed

land. The other objection, namely, that barley comes up in the succeeding wheat crops, may be overcome by thoroughly fallowing the land after the barley is taken off in the usual way.

Barley should be sown in May at the rate of 50 lb. seed and about 80 lb. superphosphate per acre. Earlier sowing tends to induce too much stooling and the grain may not fill out satisfactorily. The variety that has given the best results generally is Pryor.

THE USES OF OATS ON A MIXED FARM.

HAVING half the area sown with oats enables the farmer to direct more attention to his fallow. When good rain falls he can put all his strength on to the fallow and have it all worked up very quickly, and this helps to kill out fungous diseases and sweeten the soil. Then, when this has been done, he can give his attention to the paddocks that are to be sown with oats. If there is any land to be worked dry, let it be the paddock in which the oats are to be sown.

Now, you may ask, what do I do with so much oats, and how do I manage at harvesting time? I know it would be a big problem if the crops were left to strip, but when sowing the oats a careful study should be made as to the time of sowing them, so that there is not so much rush at harvest time. I sow my crops to come in in four stages. I first sow Mulga early for silage and later for hay or grain. Algerian I sow early for hay or silage, and the main portion, or any other varieties desired, later for grain. Make the sowing of these plots extend over four weeks, and at such a time that the oat crops will be harvested by the time the early wheats are ready to strip.

Personally, I believe there is no need to allow much of this crop to leave the farm each year. There are many ways of utilising the oats. The only time I think they should all be left to strip is in a lean year when hay or silage is not a paying proposition.

A portion of the crop could be fed off to top the lambs off in spring, and would serve to keep the lambs free from grass seeds should any fall before the lambs were trucked. Another portion could be cut for silage, as this is a good standby for a dry period. About 25 acres of fair average crop will make 100 tons of silage, and three men will sink the pit, cut and cart in the crop and cover the pit in three weeks. This will keep 1,000 sheep alive for four months with a little grain.

Then most of the hay used to work the farm and to stack for dry periods could be cut from this crop and the balance stripped for seed and feed. Having reserve fodder to draw on in dry times or droughts enables the farmer to stock his place to the full carrying capacity, and he is not forced to sell his sheep in a poor market. Under these conditions the farm flock can be increased considerably over the single system of growing wheat only. There is no comparison in the feed value of wheat stubble and oat stubble. And when rain comes in autumn there is always a chance of getting a good body of green feed on the oat stubble for the lambing ewes, especially if portion of the paddocks has previously been worked for long summer fallow.—D. BOLTE, at Wyalong Agricultural Bureau Conference.

Onion Trials in 1928.

(1) On Farmers' Plots.

J. DOUGLASS, H.D.A., H.D.D., Agricultural Instructor.

EXPERIMENTS were carried out in the chief onion-growing centres of New South Wales during the 1928 season. In many localities the experiments consisted of trials on a small scale, with the object of allowing growers to become acquainted with the better varieties. In these localities it has been definitely shown that locally saved seed of the various selections of Hunter River Brown Spanish gives the best results. Variety and manurial trials on an extensive scale were carried out in the main onion-growing centres.

The following growers co-operated with the Department in conducting experiments:—

W. T. Sunderland, Dubbo.
R. Howard, Wellington.
W. Cole, Wellington.
N. Porter, Hinton.
A. McKimm Bolwarra.

The Season.

The season was worse than the previous year, when dry weather was experienced throughout the latter end of the growing period. The past season was perhaps the driest ever experienced in New South Wales, no useful rains falling during the growing period after July. In the west, where irrigation is extensively carried out, excellent crops were obtained, and owing to the failures in other districts good returns and prices were reported. On the Hunter River, failures were experienced in the majority of cases, and the few crops that did reach maturity produced only light yields. Profiting by the experience of western growers who irrigated, it is time Hunter River farmers installed irrigation plants in order to counteract the effects of the dry spring months met with almost every year.

RESULTS of Variety Trials.

	Hunter River Brown Spanish (S. Redgrove).	White Hunter River (S. Redgrove).	Hunter River Brown Spanish (J. C. Rowcliffe).	Hunter River Brown Spanish (A. Yates & Co.).	Hunter River Brown Spanish (A. McKimm).	Hunter River Brown Spanish (W. T. Sunderland).	Southport White Globes.	Odourless.	Yellow Flat Danvers.	Prizetaker.
	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c.
W. T. Sunderland, Dubbo..	30 7 2	23 1 3	24 6 0	26 8 2	27 13 0	20 13 1	16 8 0	28 11 0	18 4 2	22 2
R. Howard, Wellington ...	7 4 0	8 12 3	4 17 2	7 4 0	8 0 3	......	......	......	......	......
W. Cole, Wellington ...	4 6	5 7 2	2 1 0	3 3 0	2 8 1	......	......	......	......	......
N. Porter, Hinton ...	3 13 [illegible]	......	4 3 1	4 5 2	4 13 0	......	......	......	......	......

RESULTS of Fertiliser Trials.

	No Manure.	M22 (420 lb.).	Super-phosphate (420 lb.).	Super-phosphate (840 lb.).	P11 (490 lb.).	P13 (560 lb.).	Basic Super-phosphate (525 lb.).
	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.
W. T. Sunderland, Dubbo	18 16 3	22 3 20	21 17 2	19 2 3	20 13 1	21 17 2	22 3 2
A. McKimm, Bolwarra	1 12 0	2 18 3	2 13 0	3 0 2	2 3 1	1 11 3	1 13 1
W. Cole, Wellington...	4 16 3	5 15 0	8 6 3	......	5 11 8	3 17 3	......
R. Howard, Wellington	8 0 0	12 10 1	9 10 2	10 1 2	12 10 1	13 16 2	11 1 1

M22 fertiliser mixture consists of equal parts superphosphate and bonedust; P11 consists of 6 parts superphosphate and 1 part sulphate of ammonia; P13 consists of 6 parts superphosphate, 1 part sulphate of ammonia, and 1 part sulphate of potash.

The Dubbo Experiments.

A manurial and variety trial was conducted on Mr. W. T. Sunderland's property. The object of the manurial trial was to ascertain the most suitable manure to use with onions on the river flats at Dubbo. The soil was

Odourless.
An exceptionally good yielder, but poor keeper.

typical river alluvial loam of great depth and fertility, and was in splendid condition. The seed was sown broadcast in seed-beds on 2nd April, 1928, and carefully watered and weeded until 29th May, when transplanting took place.

The method of laying out the field as practised by this grower should be of interest to others using the flooding system of irrigation. The field is usually cut into strips of any length, and about 1 chain wide. Along one edge of the field an open drain is made for conveying the water to the field.

The whole of the field is then cut into small beds in the following manner:—Every 3 feet 6 inches a line is marked across the bed, the soil along every alternate mark is removed in order to construct a channel, the soil being placed along the remaining marks thus forming check banks. It will then be seen that two small beds are constructed, each approximately 3 feet 6 inches wide, with a channel between them to facilitate flooding. These beds are a handy size, and can be irrigated, chipped, and weeded without walking on them. Six rows of onions can be transplanted into these beds, the rows being 6 inches apart.

The Manurial Trial.—In the case of the manurial trial the fertiliser was spread broadcast over the beds on 21st April, 1928, and lightly worked into the soil. During irrigation precaution was taken to see that the water from

Showing Method of Preparing Seed Beds for Irrigation.

one set of beds did not flow on to the other beds. This precaution was taken in order to prevent the fertiliser being carried by the water from one plot to another. Irrigation was carried out about eight times during the last few months of growth. Each irrigation was followed up by a light cultivation.

A glance at the results of the manurial trial will show that artificial fertilisers of any description will give excellent results in the Dubbo district. As on previous occasions, M22 mixture produced the greatest increase in yield as compared with the unmanured plots. The difference—3 tons 6 cwt. 3 qrs., valued at £15 per ton—represents an increased return of £50 per acre. Although Mr. Sunderland has been a very successful onion grower over a number of years, he has not previously used manures. The present results, however, have convinced him that they certainly do pay, and he has definitely decided to use them in future.

The Variety Trial.—The results of the variety trial are indeed outstanding. Mr. Sunderland was not surprised with the results, and states that he has had crops yielding over 20 tons per acre on several occasions. The results certainly indicate that, under western climatic conditions and with correct cultural methods and the right varieties, this State should be able to grow sufficient onions for its own use.

The strain of Hunter River Brown Spanish that produced the top yield has been selected by Mr. S. Redgrove, of Branxton, and is most suitable for transplanting, as is the practice in the west. The bulbs of this variety were very large, deep, exceptionally heavy, but inclined to be coarse. Odourless produced a remarkable yield, but is a very poor keeper, and is only suitable for immediate home use.

Hunter River Brown Spanish. (A. McKimm). Improved Hunter River Brown. (S Redgrove).

Southport White, Yellow, and Red Globes were included in the trial, but were found to be totally unsuitable for Australian conditions. Southport White Globe produced a yield of 16 tons 8 cwt., but the variety was very late in maturing compared with other varieties. The bulbs were uneven in shape, inclined to be necky and flat, and of only medium size. The flavour is reported to be rather hot and undesirable.

Yellow Flat Danvers is a flat yellow onion of poor appearance. The bulbs were inclined to vary in character, and were yellow in colour, necky, and the skin very fine. The flesh of the bulbs was soft, indicating a poor keeper. It is too late in maturing, and unworthy of further trial. Prizetaker and two selections of Long Keeping Brown Spanish were also tried at Dubbo, but all proved too late, and in no way compared with the Hunter River selections.

The Wellington Experiments.

The chief aim of all onion growers is to place their bulbs on the market as early as possible. The Wellington growers have for a number of years been the first on the Sydney market each spring, and have established a reputation with a flat white type. The climate and soil of the Wellington flats largely help the growers to produce early crops, although the cultural methods adopted and the planting of suitable varieties are also contributing factors. Large growers of the flat white types practise planting the seed in seed-beds as early as February, later transplanting to the field. It has been found that the flat white onion, when planted at this time, does not run to seed as does the brown strain. The chief disadvantage of the white strains lies in the lack of uniformity of the seed, poor quality bulbs, and, in many cases, failure of the crop to ripen off. It has been found in other districts that, by planting an early brown type a little later, and by using artificial

Early Barlettas at Wellington.

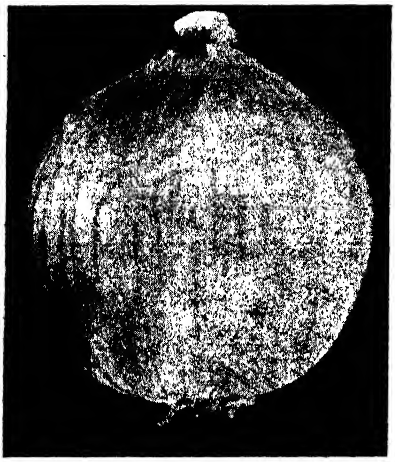
fertiliser, a crop is obtained which is only very little later in maturing, but is far heavier and of superior keeping and culinary qualities. An experiment to ascertain the correct time of planting has been carried out at the Bathurst Experiment Farm, and furnishes growers with reliable information on this subject—see page 447.

The variety trials at Wellington were not checked up with a white flat variety owing to the difficulty of obtaining a reliable suitable variety. It was found that Mr. S. Redgrove's Hunter River White was the heaviest yielder and most suitable variety in the trial for early seed planting and field transplanting. The variety is an early white globular type, of large size, with a fine skin. The individual bulbs are very heavy, of medium flavour, and for a white type it is a fair keeper.

The results of the fertiliser trials conducted at Wellington are rather confusing, and cannot be taken as conclusive. M22 mixture, although not producing the highest yields in these trials, produced excellent results, and should give good results over a number of years.

The Hunter River Experiments.

The trials carried out in co-operation with Messrs. Porter and McKimm produced very light yields, and are, under the circumstances, hardly comparable. The practice on the Hunter is to sow the seed direct in the field. This allows less time for field cultivation, with the additional risk of a patchy germination.



Hunter River White.
(S. Redgrove).

Mr. McKimm's strain of Hunter River Brown Spanish again showed out to advantage against all other varieties. This particular strain is remarkable for its earliness in comparison with other strains of the same variety, other desirable features being its very fine neck, flavour, and depth of bulb combined with weight, while the shape of this strain tends to shed rain, thus minimising the danger of rotting. A selection from Mr. McKimm's original strain is doing remakably well, and shows more uniformity of type, as well as being a heavier yielder.

Although the season on the Hunter was very dry, M22 fertiliser mixture again showed up to advantage. The phosphatic manures undoubtedly induce increased root growth in the seedling in the early stages of growth, enabling them to withstand dry conditions better than the unfertilised rows.

(2) At Bathurst Experiment Farm.

R. THOMSON, H.D.A., Experimentalist.

The production of early onions is an important feature of market gardening in the Bathurst district. To assist growers in this and other directions the following experiments were carried out at Bathurst farm:—(1) Variety trial, (2) fertiliser trial, (3) time of sowing experiment.

The Variety Trial.

The variety trial was carried out on a granite loam improved by applications of farmyard manure in past seasons. The land, which carried a fairly heavy crop of tomatoes in 1927-28, was ploughed on 26th April, cross-ploughed on 9th May, and springtoothed on 18th May. On 23rd May, M22 fertiliser mixture, at the rate of 3 cwt. per acre, was applied to the land through the wheat drill.

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The seed was sown in beds on 7th March. Germination was good in all cases except Odourless, and good sturdy plants were dibbled in on 24th May, the rows being 15 inches apart and plants 8 inches apart in the rows. The whole area was watered with a sprinkler when planting was completed. At the time the land was in good order, and the weather fine and cool. Growth during the winter and early spring was good. Dry weather prevailed, and the crop was irrigated late in October and again during the third week in November. No disease was noted, and only very slight injury was occasioned by thrips. All varieties except Barletta sent up seed stalks profusely.

The results of the variety trial sown in the vegetable garden at Bathurst Experiment Farm are as follows:—

	t.	cwt.	qr.	lb.		t.	cwt.	qr.	lb.
*H.R.B.S. (Department of Agriculture)	6	5	0	0	Barletta	4	9	1	4
H.R.B.S. (J. C. Rowcliffe)	5	19	0	2	Prizetaker...	4	5	2	24
Golden Emperor	5	14	1	14	Early H.R.B.S. (Yates) ...	4	0	2	4
White Italian Tripoli ...	5	8	3	20	Yellow Flat Danvers ...	3	16	1	20
Hunter River (Winter) ...	5	0	2	24	Brown Spanish (local) ...	3	11	1	20
H.R.B.S. (A. McKimm)...	4	18	0	24	Southport Yellow Globe...	3	7	2	10
Early Improved Hunter River (S. Redgrove) ...	4	16	1	20	Southport White Globe ...	3	1	3	24
					Southport Red Globe ...	3	1	3	14

* Hunter River Brown Spanish.

A further variety trial was carried out on the alluvial flats of the irrigation farm. The yields were as follow:—

	t.	cwt.	qr.	lb.
*H.R.B.S. (Department of Agriculture)	8	13	2	8
H.R.B.S. (A. McKimm)	7	3	2	8
Early H.R.B.S. (S. Redgrove)	6	15	0	0
Early Improved Hunter River (S. Redgrove)	6	6	1	20
Brown Spanish (local)	5	5	2	24
H.R.B.S. (J. C. Rowcliffe)	5	4	2	16

* Hunter River Brown Spanish.

The Season.

With the exception of the months of June and July, the season was rather dry. The usual frosts were experienced during the winter, but the spring was mild, only three very light frosts being recorded during October.

RAINFALL.

Before planting.	points.	After planting.	points.
April	3	June	143
May	94	July	280
		August	38
Total	97	September	67
		October	235
		November	75
		December	58
		Total	896

Notes on Varieties.

H.R.B.S. (Department of Agriculture).—Large onion, even shape and size. All marketable, thin neck, skin peels off readily. Good solid flesh, flavour mild. This is a good type, but allows room for improvement in the skin, which shells off too readily for a keeping onion in this cold climate.

H.R.B.S. (J. C. Rowcliffe).—Size large but not even. A very round onion of pale colour with a purple tinge. Neck generally thin, but some were bad. Skin peels off readily A firm solid onion of mild flavour.

H.R.B.S. (A. McKimm).—Fairly small but even, all marketable. Very deep onion, neck thin, skin tough and clings to onion fairly well. Mild flavour, rather soft type, and does not promise to be a good keeper.

Early Improved Hunter River (S. Redgrove).—Good shape, size not large but even, all marketable; fair neck, some very thick. Skin thick, clings well to onion. Not a very firm onion, slightly hollow, flavour fairly mild.

Brown Spanish (Local).—Size small to medium, some unmarketable, shape fair, neck thick, skin thick, and holds well to the onion. Solid compact onion, very firm, flavour rather hot. Good keeping variety. There are some exceptionally good types in this strain, and selections are being made with a view to improving the size and yield.

Prizetaker.—Shape uneven, varies from globes to flats, size small to medium, fair number unmarketable, neck varies, rather thick. Keeping qualities poor. Goes soft at neck. Flavour mild and fresh, very spongy. Not an attractive strain.

Southport Yellow Globe.—One or two good globes, but majority very bad shape, being long and thin. Neck very thick, skin peels readily. Onion hollow in centre. Does not keep, and the flavour is hot and unpleasant.

Southport Red Globe.—Shape deep globe, some being very long. Neck generally thick, size medium; fair number unmarketable. Onion fairly firm; good number hollow. Flavour hot and unpleasant.

White Italian Tripoli.—Shape flat but fairly deep. This is a large white onion, all being marketable. A solid onion, slightly spongy, with a thin neck. Flavour strong and peppery.

Hunter River White.—Shape round and deep, size even, all marketable, colour white, neck fairly thin. Very firm, solid onion, and promises to be fair keeper. Flavour very strong.

Of the varieties under trial this season, the Brown Spanish have proved the heaviest yielders. The Department's selection is a very fine onion, of good even type and size. Its weak point is the skin, which peels off readily, allowing the onion to be damaged. The local selection, although not a heavy yielder, has an exceptionally tough persistent skin, and by the elimination of the smaller types should prove a good yielding and keeping variety.

Of the white varieties, Barletta again proved the earliest, although White Italian Tripoli gave a better yield and produced a slightly more attractive onion. The White Hunter River selection is worthy of further trial. It

ripens too late to compete with the Barletta variety, but, being an exceptionally solid variety, it may possibly keep well and find favour in a later market. The Southport varieties are strong, and not very attractive.

The Fertiliser Trial.

A fertiliser trial was carried out on the irrigation farm. The land was a heavy alluvial loam. Beetroot was grown during 1927-28, and the land ploughed on 27th February, and then harrowed; again harrowed on 7th June.

Seed of the early Barletta variety was sown in beds on 10th March. Planting out took place on 11th June, the onions being dibbled out in rows 8 inches apart. Each plot consisted of three rows, with 3 feet between plots. The land was in fair order, although slightly cloddy. Good rain fell the week before and the week after planting. The weather was fine and frosty.

The fertilisers were applied a week after planting and chipped in. Growth was good. No disease occurred, and no thrip injury was apparent. The plots were irrigated twice during October. Harvesting took place on 5th and 6th November, the yields being as follows:—

Fertiliser.	Yield per Acre.	Increase.		Cost of Fertiliser.	Net Gain.
		Yield.	Value.*		
	t. cwt. q. lb.	cwt. q. lb.	£ s. d.	£ s. d.	£ s. d.
Superphosphate (1 part) and bonedust (2 parts)—3 cwt.	4 16 1 21	13 3 21	9 15 1	1 3 10	8 11 3
Superphosphate—3 cwt.	4 14 0 5	11 2 5	8 1 7	0 17 6	7 4 1
Superphosphate (10 parts) and sulphate of ammonia (3 parts)—453 lb.	4 6 0 5	3 2 5	2 9 7	1 13 3	0 16 4
No manure (check plot)	4 2 2 0	Loss.	Loss.	......	Loss.
Superphosphate (10 parts), sulphate of ammonia (3 parts), and sulphate of potash (3 parts)—534 lb.	4 1 3 0	0 3 0	0 10 6	2 8 7	2 18 2
Superphosphate (1 part), and bonedust (1 part)—3 cwt.	4 0 2 11	1 3 17	1 6 6	1 2 3	2 8 9
Superphosphate (10 parts), and sulphate of potash (3 parts)—435 lb.	3 15 3 26	6 2 2	4 11 3	1 11 11	10 13 5

* Onions sold at £14 per ton.

With one exception increases were recorded by the use of phosphatic fertilisers alone. The failure of the plot receiving equal quantities of superphosphate and bonedust is hard to understand. Sulphate of ammonia does not seem necessary, and potash seems rather to hinder development, as neither of the plots receiving this ingredient equalled the unmanured (check) plot. Even in a dry season like the past it would appear that a combination of superphosphate and bonedust is the most suitable fertiliser. The proportion of bonedust to superphosphate could possibly be increased in districts of greater rainfall.

Time of Planting Experiment.

To ascertain the most suitable month for sowing early onions, a series of sowings with the Barletta variety was made at regular intervals from January to June. The objective was a good yield of early onions of good quality.

The land, an improved granite loam, had previously carried a crop of broad beans. It was ploughed on 19th December, and again on 28th February, and harrowed. Each section was kept cultivated until required for planting. The onions were dibbled in 8 inches apart, in rows 15 inches apart. Each plot consisted of six rows, weights being taken from the centre four. Half of each plot received an application of 280 lb. of M22 fertiliser mixture per acre.

RESULTS of Time of Planting Trial.

	Manured.				Unmanured.			
	t.	c.	q.	lb.	t.	c.	q.	lb.
January sowing	7	13	0	7	8	0	2	24
February ,, ...	6	12	2	17	5	14	3	5
March ,, ...	4	16	3	21	3	11	1	20
April ,, ...	5	4	2	10	3	13	3	25

Notes on Sowings.

Sown 3rd January.—Planted out on 5th March. Harvested on 19th October. Bulb of good size, very even necks, very thick. Onions inclined to split. Seeded freely (21 per cent).

Sown 2nd February.—Planted out on 23rd April, harvested 16th November. Large bulbs of good quality, thin necks, ripened off well. Did not seed at all.

Sown 3rd March.—Planted 18th May, harvested 14th December. Plants very slow in getting away. Fair quality onions, slightly scalded, ripened off well. Necks thin, no seed heads.

Sown 2nd April.—Planted out 28th June, harvested 14th December. Caught up to March sowing during winter. Onions very similar, but slightly better yield.

Sown 2nd May.—Planted out 16th August. This plot made no growth, due to the dry spring conditions.

Sown 1st June.—Did not make sufficient growth in the seed-bed to warrant transplanting.

The February sowing gave the most satisfactory result this season. The onions produced were of very good quality, and exhibited no tendency to run to head.

The January sowing, although giving the greatest yield, produced a poorer quality onion, with a thick neck and a tendency to split. This was the only sowing that sent up seed heads.

The March and April sowings, while producing good quality onions, were inferior in yield and not early enough.

With the exception of the January sowing, decided increases were obtained by the use of fertiliser.

Lamb-raising Trials, 1928.

Wagga Experiment Farm.

J. M. COLEMAN, Senior Sheep and Wool Instructor, and L. BEVERIDGE, Assistant Sheep and Wool Instructor.

THE object of this experiment was to determine the relative merits of Dorset Horn and Ryeland rams as fat-lamb producers when mated with comeback ewes. The Dorset rams used were average flock quality, ranging in age from eighteen months to four years. The Ryeland rams were good quality aged animals. The ewes were average quality 4-tooth comebacks, about 25 per cent. being rather more wrinkly and smaller than desirable.

The ewes were in good store condition when mated on 6th December, 1927, mating extending until 27th January, 1928. Both breeds of rams were also in good condition. The ewes were separated into two groups by running off through a gate, thus obviating any unevenness in the two mobs. Two hundred and forty ewes were mated with six Ryeland rams (2½ per cent.), and 560 with fourteen Dorset rams (2½ per cent.).

Prior to mating the sheep had been dipped.

After mating the two groups were run together on good grass and stubble with short periods in lucerne. The ewes were crutched carefully during the first week in March, this being rather too soon before lambing, but the activity of the blow-fly made further delay inadvisable. The two groups were separated ten days before lambing commenced, the Dorset mob being run on a cultivation paddock of excellent feed and the Ryeland mob on a good grass paddock, half of which had been manured with superphosphate. The ewes were in forward store to fat condition at the commencement of lambing.

The blow-fly pest was very troublesome immediately prior to crutching and again during Easter, and to a lesser extent during lambing.

The first lamb was dropped on 5th May, and conditions throughout were very favourable, mild weather prevailing and losses of lambs being comparatively light, but more lambs would have survived had not the fly activity necessitated a good deal of handling and consequent disturbing of the mob. An important point noted, in view of the limited fattening period under Riverina conditions, was that the majority of the Dorset cross lambs were dropped within the first month of the lambing period, whereas the Ryeland cross lambs were mostly born during the latter stage.

Following are details of the lambing :—

Breed of Ram—	Ewes Mated.	Ewes Died at Lambing.	Ewes Assisted.	Lambs Born.	Deaths before Marking.	Lambs Marked.	Percentage Marked.
Dorset Horn	560	4	9	442	34	408	72
Ryeland	240	1	6	142	20	122	50

After lambing the mobs were run together, the Ryeland cross lambs being first ear-marked. The flock was then run on a rather forward crop of Mulga oats and Waratah wheat (about 15 inches high) on and off from 22nd June until 4th July, a total period of about nine days. Losses occurred from dietetic causes, seventeen ewes but no lambs dying. Losses from this cause have been very common throughout the district this season.

After marking on 12th July, the mob was run in a well-spelled grass paddock of 210 acres carrying excellent feed. From 28th July until 3rd August 50 acres of lucerne was fed off. Following this the sheep were again run on the 210-acre block. While shearing the ewes (18th September to 13th October) the mob was run on a rather poorly-grassed paddock and fed 3 oz. sheep nuts per head per day. Both ewes and lambs ate these readily, although the latter were a few days acquiring a liking for them. After shearing, the sheep were depastured again on the 210-acre block and allowed access to 50 acres of lucerne for 1½ hours per day. The best of the lucerne having been fed off and dry conditions still prevailing, on 26th September the allowance of nuts (3 oz.) was renewed until the first batch of lambs was marketed.

During the whole period from birth to marketing the lambs made satisfactory gains, and when the first batch was sold on 18th October the majority were in prime condition and well suited to the export trade.

In order to obtain comparative values the lambs were marketed in the same proportion as they were marked, and on 18th October two trucks were sold, comprising 169 Dorset cross and fifty-one Ryeland cross lambs. The prices realised were disappointing in view of the excellent quality of the lambs, the Dorset Horn cross averaging 21s. 10d. and the Ryeland cross 20s. 7d. The selling agents reported that the quality of both crosses was excellent, but the market was low owing to the heavy supply of sucker lambs yarded.

A further lot of the lambs, made up of eighty-nine Dorset cross and twenty-seven Ryeland cross, was sold a little later, 20s. 6d. per head in the paddock being realised.

Owing to the dry season the remaining lambs did not reach a marketable condition. In order to finalise this report they are being included at the very low valuation of 10s. per head.

The following table shows the return per ewe mated :—

Breed of Ram.	Ewes Mated.	Lambs Sold.	Average Price.	Total Return from Lambs Marketed.	Lambs retained on Farm at 10s. each.	Total Return from Lambs.	Value of Ewes Died at £1 each.	Net Return from Ewes.	Average Return per Ewe Mated.
			s. d.	£ s. d.	£	£ s. d.	£	£ s. d.	s. d.
Dorset Horn...	560	258	21 4	275 14 4	75	350 14 4	4	346 14 4	12 5
Ryeland ...	240	78	20 7	80 3 3	22	102 3 3	1	101 3 3	8

The ewes returned approximately 13s. 2d. per head from the wool clip.

The season during the winter was favourable, but dry conditions prevailed during the spring, and all the available feed (especially the 50 acres of lucerne) had to be handled judiciously in order to maintain the growth of the lambs until fit for market. No doubt the sheep nuts helped materially, but it is considered that a greater area of lucerne would have been of more value.

Both crosses were attractive lambs, but the Dorset cross made quicker gains. The Ryeland cross possessed the more attractive carcase, being less leggy. When marketed the Dorset cross was on the average, heavier than the Ryeland, and it is considered that this is the reason for the higher price obtained.

Conclusion.

The Dorset Horn ram is beyond doubt the more suitable breed for use in fat-lamb production under Riverina and similar conditions.

Although the difference in price realised was not very great (1s. 3d. per head in favour of the Dorset), it is nevertheless a consideration, but the most important factor influencing this decision is the low lambing percentage (50 per cent.) of the Ryeland group as compared with the 72 per cent. of the Dorset group. This result is consistent with previous years' experiences, and it may be definitely concluded that the Ryeland ram is unsuitable for Riverina and similar districts, primarily because of its sluggishness and disinclination to cover the ewes during the hot period, December and January, when it is necessary to mate.

In point of symmetry of carcase the Ryeland ram is more attractive than the Dorset, and as regards hardiness it is a sheep to admire, maintaining its condition under hard conditions even slightly better than the Dorset.

A factor which may be thought to adversely influence the results of this trial is that the Ryeland rams used were all aged four years and over, whereas the Dorsets ranged from eighteen months to four years old, but it should be noted that when used in previous trials as younger rams, the same low lambing percentage was constantly recorded.

Hawkesbury Agricultural College.

J. M. COLEMAN, Senior Sheep and Wool Instructor, and J. R. I. MACKEE, Assistant Sheep and Wool Instructor.

THE object of these trials was to test the qualifications of the Dorset Horn, Border Leicester, and Romney Marsh for lamb-raising under the conditions prevailing at the College. Two-tooth rams of the above-mentioned breeds were used in the experiments in conjunction with crossbred and comeback ewes. In addition to the ordinary College ewes, 291 Romney Marsh cross ewes, bred at Arrawatta, were included, being divided equally between the three breeds of rams. These ewes had experienced very severe droughty conditions at Arrawatta, and were low in condition on arrival at the College.

The mating was as follows :—

Period of Mating.	Breed of Ram.	No. Used.	Percentage	Breed of Ewe.	Total.
30th December, 1927, to 23rd March, 1928.	Dorset Horn ...	4	2	154 Crossbred ... 40 Comebacks	194
	Border Leicester	5	2½	153 Crossbred ... 40 Comebacks	193
	Romney Marsh...	5	2½	152 Crossbred ... 40 Comebacks	192

The Arrawatta crossbred ewes were mated on 30th December, 1927, the rams being with the ewes until 25th January, and then removed and hand-fed for approximately one week on a ration consisting of ¼ lb. crushed oats in addition to grazing lucerne. The rams were again joined on 3rd February, and finally removed 2nd March.

The College crossbred and comeback ewes were mated on 3rd and 15th February respectively, and the mating period was approximately seven weeks. The rams received additional feed consisting of crushed oats and chaff. This was fed when the mated groups were yarded over-night (twice per week) to ensure better service. All the rams appeared to work well. The type of pasture that the ewes were running on during the mating period consisted mainly of natural pasture (couch) and grazing lucerne. All the ewes were crutched to ensure good service.

During the gestation period the ewes were run together on couch pasture and fallow paddocks until a fortnight before lambing, when they were placed on green lucerne to ensure an adequate supply of milk for the lambs.

The Arrawatta ewes commenced lambing on 7th June, while the College crossbreds and comebacks commenced on 6th and 19th July, respectively. The weather conditions during these periods were ideal and an abundance of succulent fodder (green lucerne) was available.

The ewes were lambed in one lucerne paddock and distinguishing marks were placed in the ears of the lambs a few days after they were dropped. When ear-marked both the lambs and ewes were placed in an adjoining paddock of lucerne, where they were kept until marking. The unsatisfactory lambing percentage from the crossbred ewes is largely due to the Arrawatta crossbreds, which gave very disappointing results. This should improve next season.

Following are details of the lambing :—

Breed of Ram.	Ewe.	No. Mated.	Ewes Died at Lambing.	Ewes Assisted.	Lambs Born.	Lambs Born Dead or Died prior to Marking.	Lambs Marked.	Percentage Marked.
Dorset Horn ...	Crossbred	154	...	...	60	1	58	38
	Comeback	40	2	4	32	...	32	80
Border Leicester ...	Crossbred	153	...	5	68	6	62	41
	Comeback	40	1	3	46	3	43	108
Romney Marsh ...	Crossbred	152	1	2	104	1	102	67
	Comeback	40	1	3	35	2	33	83

In most cases where assistance was given, the forelegs were not forward enough, but in several, particularly the Border Leicester x comebacks, both legs were bent back along the sides.

The lambs were marked at the age of approximately one month, and after marking were grazed on fodder crops (lucerne and Mulga oats) until three weeks before marketing, when they were topped off on lucerne alone. The past few months have been exceptionally dry, so it was deemed advisable to sell the first draft as soon as possible. The lambs were a little light in weight, but considering this fact and also that the market proved weak, they realised satisfactory prices :—

	Per head. s.	d.
42 Border Leicester crosses	19	10
29 Romney crosses	18	1
29 Dorset crosses	17	7

These lambs were sold on 22nd November, 1928, at the average age of 4½ months.

A further draft was marketed on 21st December, bringing the following prices :—

	Per head. s.	d.
20 Dorset Horn crosses	16	7
33 Border Leicester crosses	15	3
27 Romney Marsh crosses	16	10

Owing to the dryness of the season, the remaining lambs have not reached a marketable condition, and in order to finalise this return are valued at the low price of 10s. per head.

The following table shows the return per ewe mated :—

Breed of Ram.	Ewes Mated.	Lambs Sold.	Average Pr		Total Return from Lambs Marketed.			Value of Lambs retained on Farm at 10s. each.			Total Return from Lambs.			Value of Ewes Died during Lambing at £1 each.	Net Return from Ewes.			Average Return per Ewe Mated.	
			s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	£	s.	d.	s.	d.
Dorset Horn ...	194	49	17	2	42	1	7	20	10	0	62	11	7	2	60	11	7	6	3
Border Leicester	193	75	17	10	66	16	3	15	0	0	81	16	3	1	80	16	3	8	4
Romney Marsh	192	56	17	6	48	18	11	39	10	0	88	8	11	2	86	8	11	9	0

Infectious Diseases Reported in April.

The following outbreaks of the more important infectious diseases were reported during the month of April, 1929 :—

Anthrax	2
Blackleg	3
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia contagiosa	6
Swine fever	Nil.
Contagious pneumonia	Nil.

—Max Henry, Chief Veterinary Surgeon.

Lameness in Lambs.

A Review of our Present Knowledge.

H. R. SEDDON, D.V.Sc., Director of Veterinary Research.

About three years ago the occurrence of lameness in lambs and young sheep was brought under notice from several districts, and after investigation it was found that such might be due to more than one cause. Our knowledge was then reviewed in an article which appeared in the *Agricultural Gazette* for August, 1926.

Since then the opportunity has presented itself of studying the matter further, and as additional information has been gathered it is opportune to review again our knowledge of the subject.

Types of Lameness met with in Young Sheep.

Before discussing this in detail, it may be well to point out that lameness is not in itself a disease, but a symptom. Lameness is the manifestation of some structural or functional disorder of some part of the locomotory apparatus, characterised by a limping or halting gait. Briefly put, it may arise from mechanical injury to, or disease of, any of the structures of the limbs, and it follows, therefore, that there may be many different kinds of lameness in sheep, as in the horse. Probably the most common cause of lameness in sheep is some affection of the feet, such as foot-rot, and next most common we should expect some disease of the joints. The symptoms of the different types of lameness vary with the parts affected.

We shall now consider the various types of lameness that have been met with.

1. Foot-rot.

This is a well-known condition, which affects the claws and the tissues at the junction of the digits. An account of the disease was given by Mr. C. L. O'Gorman, M.R.C.V.S., in the *Agricultural Gazette*, vol. 32, April, 1921, page 253.

Not only is foot-rot different from other types of lameness to be described in that it affects the feet and produces very obvious lesions in that part of the limb, but the type of the lameness is quite different from those cases where the joints higher up the limb are involved. Further, the fore-limbs are more often affected than the hind-limbs.

The progress of the disease in the absence of proper treatment is well known, as is also the fact that heavy mortality may ensue if the animals are neglected.

Predisposing factors, such as softening of the horn, &c., by wet or swampy surroundings, excessive growth of horn, &c., play a leading part in determining this condition. The infection may be a mixed one by the

common pus-producing organisms, as in the non-contagious form, but where the disease affects many animals (so-called contagious form) and the lesions are severe the causal organism is *Bacillus necrophorus.*

2. Arthritis in Lambs and Young Sheep (Inflammation of the Joints).

Arthritis in lambs and young sheep may be divided into two types according to the nature of the causal microbe. These, however, are quite distinct clinically, and we may refer to them as the *suppurative* and *non-suppurative* types.

(*a*) *Suppurative Arthritis.*—By this we mean a type of inflammation of the joints where pus is present in the joint and the tendon sheaths around the joints, and, as is common with purulent affections, the pus breaks out.

Figs. 1 and 2.—Suppurative Arthritis.
Note the abscesses near the knee joints and elbow.

The cause is a staphylococcus, and it may get into the joint in one of two ways: (i) Through the navel soon after birth and before the cord dies off, or (ii) through tailing and/or marking wounds.

Staphylococci are the common cause of boils in the human subject and are also found commonly in septic wounds. In young lambs the joints are extremely susceptible to infection, and when staphylococci reach the blood stream, as they may from the navel or marking wound, they soon become located in one or more of the joints. The lameness in these cases is of a very acute type with much swelling of the joints affected. The shoulder, elbow, hock, and stifle are most commonly affected, and it is usual to find the nearest lymphatic glands (or kernels) involved. The appearance is much the same as if one or more boils were present either in or near the joint or the lymphatic gland. And, as is common with boils (abscesses), the pus tends to break out through the skin. Incision of joints, tendon sheaths or swellings reveals greyish-yellow pus in more or less considerable quantities. If the abscesses have opened spontaneously the contents are usually foul-smelling from the entrance of other microbes.

Animals usually succumb early, but the abscesses may burst and the pus, being voided, a certain degree of healing takes place. Commonly, however, there is a succession of abscesses. The pus in the joint soon leads to that part becoming stiff (anchylosed), so that permanent lameness may result. There is always a fair amount of thickening in the vicinity of the joint in these cases. This type of lameness would, therefore, be seen in its acute form either about a week after birth or a week after tailing or marking. If the lambs survive, the disease may continue in a chronic form for several months.

Treatment might be attempted in these cases by opening up any abscesses and draining them, but owing to the difficulty of dealing with joint inflammations one should andeavour to prevent them. Ewes should be lambed on a clean pasture if possible and tailing and marking operations should be undertaken with proper antiseptic precautions.

(*b*) *Non-Suppurative Arthritis.*—The cause of this is a microbe, which, up till comparatively recently, had not been met with It is quite distinct from the staphylococcus and is a bacillus which was first isolated by Mr. H. R. Carne, B.V.Sc., at Glenfield Veterinary Research Station, from material supplied by Stock Inspector Ryan, of Coonamble. The disease has been seen in other districts, and was reported on three occasions by Mr. W. L. Hindmarsh, M.R.C.V.S., B.V.Sc., when District Veterinary Officer at Armidale.

The inflammation produced in these cases is distinguished from the foregoing by the following :—

- (i) That the swelling of the joints may commonly be slight or even not detectable.
- (ii) That the amount of inflammatory exudate is generally small in quantity and the joints may even contain considerably less fluid than normal.
- (iii) That the fluid never breaks through the skin.
- (iv) That the mortality is usually nil, though loss of condition may be considerable.

A further point is that quite frequently the lameness, though acute when seen, may be transient in character.

The causal organism evidently gets in through some wound, and the commonest seems to be a marking, tailing or castration wound. As it has been seen in an untailed, but ear-marked, ewe lamb it evidently may get in through the small wound made by the ear cutters. The disease is, therefore, seen shortly after marking operations and manifests itself by a severe lameness, though, when an affected animal is caught it may be impossible to detect the affected joint or joints. Swelling may be negligible, no great heat present, and pain impossible to elicit. This is because the disease is really present in the ends of the bones. If the joints be opened in such a case one finds

that the joint fluid is slightly cloudy, that is all. If the bones of the limb be boiled, however, it will be found that, after the cartilage (gristle) has been removed, there are small pits or holes in the ends of the bones themselves. These cannot be seen in the fresh specimen but on careful examination one may possibly detect small reddish spots underneath the cartilage. Any of the limb joints may be affected, and commonly several joints and more than one limb are involved.

The great majority of animals recover after a few days lameness, during which they have manifested also the common signs of fever, viz., off food and listlessness. Loss of condition also occurs. A certain percentage of the lambs may, however, remain chronically lame. Even then there is no marked swelling of the joints, but as the disease persists certain joints may become stiff and immovable. In such cases, if the joint is examined, one

Figs. 3 and 4.—Non-suppurative Arthritis.
Showing deformity in limbs seen in chronic cases.

commonly finds it almost dry, and the cartilage covering the end of the bones roughened. The joint capsule is also thickened and shows what are termed granulations. In some of these cases, however, the amount of fluid in the joint may be in excess of that seen in a normal joint.

In these chronic cases it is not uncommon to see affected animals moving about on their knees or with the knees constantly bent. When the hocks are affected these joints are usually held stiffly. If one boils the bones of a chronically lame animal one finds, in addition to the pitting of the bone (referred to above), that there is a growth of fine coral-like bone around the joint, and it is the joining of the bones by this new bony growth which is responsible for the stiffness. This is seen especially in the knee and hock.

Recently Mr. A. L. Rose, B.V.Sc., District Veterinary Officer, and myself saw a number of cases of older lambs, and where the manner of infection could not be determined with certainty. On the same property sheep of two ages were affected. These were all rams, and at the time the disease broke out the older rams would be seventeen months old. A month after

they were affected the disease made its appearance in weaners (six months old). The older rams were affected immediately after dipping and possibly this operation facilitated infection. The younger rams had, however, been dipped some weeks before the disease appeared in them. A consideration of paddock movements indicated that possibly infection might have been gained from one paddock—the paddock where the older rams were running—as the younger rams passed through this paddock immediately prior to the appearance of the disease. The only possible avenue of infection seems to have been by means of grass-seed which, although generally scanty, was plentiful around a trough in the paddock referred to, where there was a large clump of barley grass. At this trough the younger lambs were watered, and it was noted that they attacked this dry seeding grass with avidity. It would seem likely, therefore, that these younger sheep gained infection from this vicinity and by the means suggested. Possibly, infection was not through the skin, but by injury to the gums through penetration of grass seed around erupting teeth. The outbreak in question was a serious one, inasmuch as the lameness has continued in a large proportion of the sheep. The heavy frames of these sheep (rams), as compared with young lambs, may possibly account for this.

Where this non-suppurative type of arthritis follows contamination of marking wounds, prevention is possible by the application of an antiseptic dressing to tailing and marking wounds, by marking on new ground, and by the proper sterilisation of instruments.

3. Lameness from Grass-seed Infestation.

As is well known, sheep badly infested in the wool with grass-seeds often show an alteration in gait.

In this case the lameness varies from a stiffness of gait, due to the great "mat" of seed in the wool interfering with the flexibility of the skin, to a distinctly painful type of lameness due to the penetration of the seeds through the skin, and the consequent irritation of the sensory structures of it. A marked "tenderness" in movement is frequently noted.

In addition, the animal at times shows a distinct lameness of one or more limbs. Such cases are probably associated with a bacterial infection entering with the grass-seeds. Thus the causal microbe of caseous lymph-adenitis may enter in this way. It would seem also that, as mentioned earlier, the causal organism of the non-suppurative type of arthritis may gain entrance by the same means.

4. Lameness due to Blow-fly Attack.

As is well known, lambs are not infrequently attacked by the sheep blow-fly, which may "strike" an animal in some wound (*e.g.*, tailing or marking wound), or even on some area where the skin has not been broken. In the latter case a common situation is the crutch, and when that part

is the site of an attack which has led to ulceration of the skin, or when the scrotum has been badly attacked, the pain consequent on movement causes the animal to exhibit a shuffling gait. In cases where the attack is more to one side, the presence of the septic "maggoty" wound on the back or inside of a hind limb may cause the animal to favour that limb.

5. Obscure Lameness in Young Sheep.

A peculiar type of lameness was brought under notice during 1926, and though the cause remains obscure it is mentioned as evidence of the fact that we have yet more to learn of the cause of lameness in young sheep. In this case the affected animals were ram lambs, four to five months old. Only odd animals died from the condition, which, as a rule, lasted about three weeks, and was followed by complete recovery.

Fig. 5.—Non-suppurative Arthritis, Showing Enlargement of Joints as seen in Chronic Cases.
Note enlargement at pastern, fetlock and hock of limb on left.

The symptoms, as described by Mr. H. G. Belschner, B.V.Sc., District Veterinary Officer, were as follows:—

"The affected rams exhibit lameness and some cases a general stiffness when walking, some lame in the fore legs, others in the hind legs. The animals become isolated from the rest of the mob, and are seen under trees and near logs lying down, sometimes at full stretch. In early stages they frequently get up and down, but as the condition becomes acute they remain in the recumbent position. The lameness has the appearance of being in the feet, and is very similar to that in sheep affected with foot-rot. Sheep sometimes carry a leg."

A number were examined carefully for foot-rot, but no signs of that disease were present. Constitutional symptoms, such as lacrymation, slight nasal discharge, and some degree of fever were present. On further examination, it was found that there was little to account for the lameness, a slight enlargement of the fetlock and some thickening of the skin over the knee from kneeling being all that could be detected. In an odd case pain was elicited on manipulation of the fetlock joint.

In an animal upon which we had the opportunity of making a post-mortem examination, no lesions could be detected beyond very slight lesions of arthritis in a fetlock joint, which during life appeared to be painful. No bacteria were found in any of the joints, and the lesion found was too small to account for the symptoms shown. The symptoms would indicate, however, that the lameness affected either the fetlock joint or the foot.

Though the cause was not determined it is felt that the cases were probably due to the non-suppurative arthritis described earlier (see heading No. 2), the failure to find the causal organism being due to the fact that the animal was recovering. It will be noted that in this instance the disease lasted only about three weeks and was followed by complete recovery, whereas in the cases in rams described earlier the condition became chronic.

Other Causes of Lameness.

All disturbances of gait are not necessarily to be referred to bacterial agents. Certain plants have been found to cause quite well marked locomotory disturbances, though such perhaps would not come under the ordinary category of lameness. Examples of this are furnished by the Loco weeds of North America, and the Darling pea and rough-bearded grass (*Echinopogon ovatus*) in this State.

What further investigation may bring to light is a matter of speculation.

Discussion.

From the foregoing it will be readily seen that we may include under the term lameness several quite distinct affections, different in cause, different in symptoms, and differing in the age of animals attacked.

Appropriate measures of prevention and treatment can be based only upon a full understanding of each condition, and upon accurate diagnosis in individual outbreaks. Much remains yet to be done, and the wholehearted co-operation of owners is sought in order that we may gain a full knowledge of the conditions, which may be briefly described as " Lameness in Lambs "

Imports of Peanuts to Australia.

In 1926–27 Australia imported 5,870,334 lb. of shelled and unshelled peanuts valued at £69,662, and in 1927–28 1,839,896 lb., valued at £22,885, were brought in principally from China.

During 1927–28 Australia also imported 102,853 lb. of peanut butter from U.S.A. valued at £9,000.

Proving the Dairy Bull.

The proving of meritorious dairy sires in large numbers is one of the great problems before our dairymen to-day. When farmers have the proper appreciation of the value of the proved bull, we shall be able to prove hundreds of dairy sires each year in our association work. Judging from the results obtained from the bulls already proved, one-third of the bulls proved in the future will be highly meritorious. From the extensive use of these bulls our dairy herds will improve rapidly, and average production of milk and butter-fat per cow will reach higher levels than before.—J. C. McDowell, Bureau of Dairy Industry, United States Department of Agriculture.

Hydatid Disease.

Digest of an Article by I. CLUNIES ROSS, D.V.Sc., Veterinary Parasitologist, Council for Scientific and Industrial Research.

HYDATID disease is perhaps the most important parasitic disease of man in Australia. It is caused by the presence in the internal organs of large bladder-like cysts, which are larval or immature stages in the development of a very small tapeworm of the dog. The disease is perhaps most common in parts of the sheep-raising country of Victoria, the south-eastern part of South Australia, and the northern and southern tablelands of New South Wales, while it also occurs in sheep-raising areas in Queensland, Western Australia, and Tasmania.

Apart from the effect of the disease on human health, since cattle, sheep and pigs are all very commonly affected with hydatids, there is a considerable economic loss occasioned by the destruction of the organs of these animals condemned on account of the presence of the same disease.

At one time the disease was extremely common throughout Australia and much attention was directed to it. Consequently, the number of cases decreased, but of late there appears to be a tendency towards an increase. It is certainly very prevalent among cattle and sheep in New South Wales.

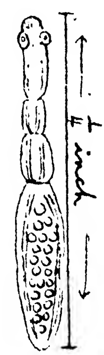

Fig. 1.—The Adult Hydatid Worm.

It is found only in the bowel of the dog. So small is this worm that any apparently healthy dog may harbour many thousands without showing signs of their presence.

The adult parasite is a very small tapeworm found in the intestines of the domestic dog. It is so small that unless very carefully looked for it will not be seen. The eggs of this tapeworm pass on to the soil, and may remain there for some weeks, but cannot develop unless swallowed by either man or some other animal.

With regard to domestic animals these eggs are swallowed with the grass as the animals graze over the infected pastures. They hatch in the intestines and a minute larval worm emerges, bores into the bowel wall and enters a blood vessel. It is then carried to the liver, lungs or other organ and development into the cyst proceeds. These cysts interfere with the normal functions of the organs. If a liver or other organ containing this

cyst is eaten by a dog, the tapeworm head enclosed in the cyst attaches itself to the wall of the dog's bowel and develops again into the adult worm.

How Man Becomes Infested.

Man cannot become affected from eating the cysts of sheep or cattle, and if no dogs were allowed to eat organs containing these cysts all danger of men contracting hydatid disease would cease The methods by which man most frequently becomes infested are probably the following:—

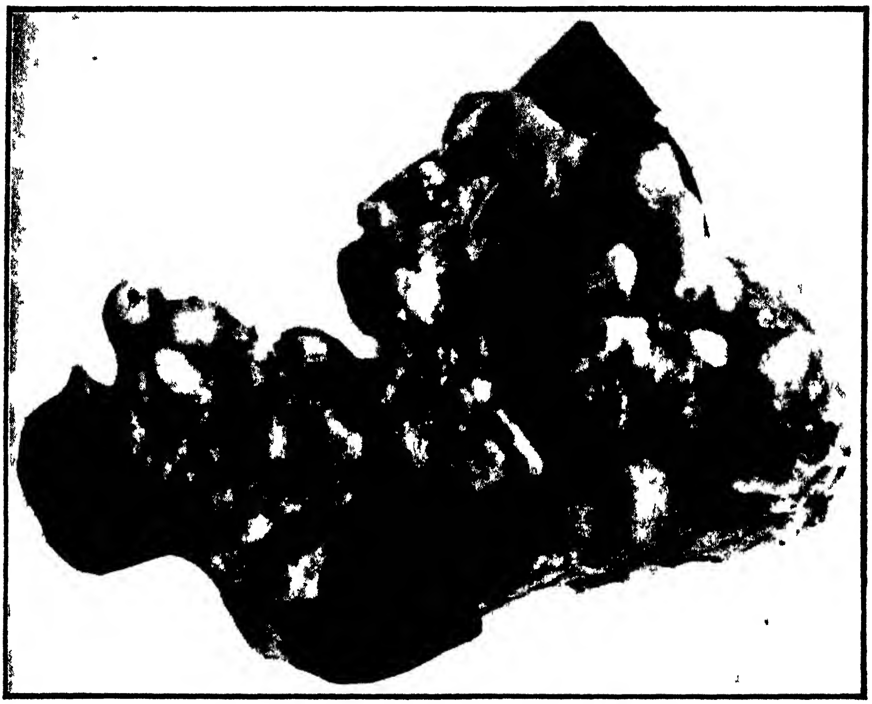

Fig. 2.—Hydatid Cysts in the Liver of a Sheep.
Dogs can only become infested with the adult hydatid worm by eating these cysts in uncooked meat. Cooking kills the cysts.

By carelessness in handling country dogs. It is obvious that it would be quite possible for the dog to have some of the eggs of this tapeworm on its coat. If the dog is handled by a man these eggs may be transferred to his hands, and if he then handles his food without previously washing his hands the eggs might be transferred to the food swallowed, the man thus becoming infected with hydatid disease. The danger is naturally greatest regarding children, who exercise less care in personal cleanliness.

It was at one time considered that contaminated water and green vegetables constituted the most common sources of infection, but it is probable that these methods of infection are not comparable in importance with that incident on the careless handling of dogs.

It is, of course, possible that flies may carry the eggs of the tapeworm on their feet and so infect food. It is another argument to the many which can be adduced for the necessity of reducing flies to a minimum.

The risk of infection from the average house cat is very slight, nevertheless it should not be overlooked. The cleanly habits of the cat as compared with the dog reduce the risk very greatly.

Occasionally foxes and dingoes might be sources of infection of man, but are probably an important factor in bringing about infection of stock.

Unfortunately, the presence of tapeworm in a dog does not give rise to any noticeable symptoms. From the circumstances under which they live, country dogs are far more likely to be infected with this tapeworm than city dogs.

Fig. 8.—Tapeworm Heads from Hydatid Cyst in Liver of Sheep.

Seven weeks after the cyst is eaten by the dog these heads form the adult hydatid worms shown in Fig. 1. Such a dog is then a direct danger to man.

Control of Hydatid Disease.

Control of the disease may be attempted in two ways, firstly, by preventing infection of man and herbivorous animals, and, secondly, by preventing infection of the dog. The second is the more important factor.

Since the dog can only become infected by eating hydatid cysts in raw meat, the complete prevention of this habit would go very far to eradicate the disease in man, and would be a considerable step forward in preventing the disease in animals. The dogs most likely to be fed on raw meat containing hydatid cysts are station dogs and slaughter-yard dogs. Where sheep are killed on a holding for rations the greatest care should be exercised to see that no infected organs are thrown to the dogs to eat. They would, of course, be quite harmless if boiled for ten minutes. Keeping the organs

and feeding them later will not prevent the dogs from becoming infected, as the cysts may, in winter, remain alive for some weeks. No dog should be allowed into slaughter-houses, and on no acccount should raw organs containing hydatid cysts be given to them to eat.

One method by which carcases in a slaughter-house may become infected is the use of water for washing down the carcases which might have been contaminated by the droppings of a dog. Only water from a source which cannot become contaminated should be used for this purpose.

Fig. 4.—A Common Practice that is very Dangerous.

By feeding raw organs of sheep or cattle to dogs in this way there is every chance that they will become infested with the hydatid tapeworm. By cooking such offal for a few minutes it is rendered harmless.

Efficient control and inspection of slaughter-houses would go far to prevent infection, and as inspection is always more efficient where slaughter is centralised, every town of any reasonable size should be provided with a public abattoir, at which an inspector is always present.

The prevention of infection in man is largely a personal matter, the risk increasing with the carelessness of the individual. Much benefit would follow if necessary steps were taken to keep dogs free from tapeworms, and an educational campaign in the schools would undoubtedly have valuable results.

AUSTRALIA'S IMPROVED CANNED FRUITS.

THE *Times Trade and Engineering Supplement* says that satisfaction is expressed at the improvement in the quality of Australian canned fruits now being sold in London. The fruits approach more nearly than ever before the standards set by leading foreign packers, and the distributive trade is quick to notice the advance.

Imports and Exports of Fruit.

The following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 31st March, 1929 :—

Description.	Imports.	Exports.
Interstate.		
	Cases.	Cases.
Fresh Fruits ...	719,573	76,312
,, Tomatoes..	60,187	...
	doz.	doz.
Melons	190	...
	trucks.	trucks.
,, ...	6	...
	crates.	crates.
,, ...	1	...
	lb.	lb.
Canned Fruits ...	57,834	1,652
Dried Fruits—		
Unspecified ...	11,256	728
Currants ...	6,650	392
Raisins ..	6,888	168
Sultanas ...	...	...
Apricots ...	1,344	..
Apples ...	1,848	...
Peaches ...	924	...
Pears	588	...
Prunes ...	1,512	...

Description.	Country of Origin.	Imports.	Exports.
Oversea.			
Fresh Fruits—		Centals.	Centals.
Apples ..	....	...	1,207
Bananas ...	....	5,941	...
Lemons ...	....	...	80
Oranges ..	....	...	2,463
Grape Fruit ...	....	...	6
Pears	....	...	871
Pineapples ...	....	...	738
Other	....	371	1,613
Dried Fruits—		lb.	lb.
Apples, Pears, Peaches ...	U.S.A.	625	...
Apples ...	....	...	1,369
Apricots ...	....	...	534
Currants ..	....	...	9,109
Prunes ...	France	120	497
	U.S.A.	106,104	...
Peaches ...	....	...	310
Raisins—			
Sultanas ...	Asia Minor ..	1,041	6,431
	U.S.A.	3,488	...
Lexias ...	....	...	..
Other ...	Hawaiian Island	135	740
	U.S.A.	3,544	...
Dates	British	1,325	48,405
	Mesopotamia ...	838,929	...
Other—	Asia Minor ...	7,577	2,850
	China	3,269	...
	France	24	...
	Greece	2,023	...
	Syria	2,281	...
	United Kingdom	210	...
	U.S.A.	2,392	...
Preserved in liquid—			
Apricots ...	....	...	63,414
Peaches ...	....	...	107,907
Pears ...	....	...	6,325
Pineapples ...	....	...	968
Raspberries	....	...	1,968
Other ...	....	...	25,902

Corn Husks Bring Big Prices in U.S.A.

According to ***Farm Mechanics***, March, 1929, $150 per ton is being paid for dry corn shucks in 25 to 50 lb. bales, with the butts all at one end. They are used for polishing hard rubber, for which purpose they are better than anything else thus far discovered.

A ton of husks can be gathered from about 10 acres.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36A, G.P.O., Sydney, not later than the 12th of the month.

Wheat—

Canberra	B. J. Stocks, Cunningar.
	Manager, Experiment Farm, Condobolin.
	Manager, Experiment Farm, Trangie.
Clarendon	C. T. Anderson, Swan Vale.
Cleveland	W. Burns, Goongirwarrie, Carcoar.
Federation	E. J. Johnson, Wongalea.
Florence	Manager, Experiment Farm, Trangie.
Hard Federation	Manager, Experiment Farm, Trangie.
Marshall's No. 3	B. J. Stocks, Cunningar.
Nabawa	Cullen Brothers, Dubbo.
Queen Fan	C. T. Anderson, Swan Vale.
Turvey	B. J. Stocks, Cunningar.
Union	Manager, Experiment Farm, Temora.
Waratah	R. O. Stiles, Narromine.
	E. J. Johnson, Wongalea.
	B. J. Stocks, Cunningar.
	Manager, Experiment Farm, Condobolin.
	G. T. Troy, Bland, Quandialla.
	Manager, Experiment Farm, Trangie.
	C. T. Anderson, Swan Vale.
Yandilla King...	R. O. Stiles, Narromine.

Tomatoes—

Sunnybrook Earliana ...	A. E. Johnson, Green Valley, *via* Liverpool.

Onions—

Early Improved Hunter River	S. Redgrove, Sandhills, Branxton.
Early White Hunter River ...	S. Redgrove, Sandhills, Branxton.
Hunter River Brown Spanish	C. J. Rowcliffe, Fairfield, Dubbo.

Potatoes—

Factor	K. Bowen, Springside *via* Orange.
	E. A. McAlister, Richlands, Taralga.
	R. J. Ball, Stonequarry, Taralga.
	D. Wright, Stonequarry Taralga.
Factor and Early Manistee ...	J. J. Cusack, Richlands, Taralga.
	J. P. Cusack, Stonequarry, Taralga.
Up-to-Date	A. Johns, Myrtleville, *via* Goulburn.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Poultry Notes.

JUNE.

E. HADLINGTON, Poultry Expert.

DURING the early part of this month all activities should be concentrated upon preparations for the rearing season. If the incubators have not already been overhauled this is the first consideration. They should be examined to see that the regulating devices are in order, and repairs necessary to trays, &c., should be effected.

In machines having hessian and flannel-covered frames in the bottom, the coverings may need renewal, or if there is a calico or hessian diaphragm in the top this may have holes in it, necessitating repair or replacement. Again, where the diaphragm is of hessian it should be noted whether the material has become very open in the meshes and thus be likely to cause an uneven distribution of heat. This often occurs after a few years of use, and the hessian should be renewed to avoid bad results. All lamp burners should be cleaned by boiling them in soapy water to which has been added a small quantity of washing soda. It is also advisable to start the season with new wicks and clean lamp fonts. The heater flue and other adjacent parts must not be overlooked. Any soot, cobwebs, or flaky material should be removed by means of a rag on the end of a wire, especially kept for the purpose.

Next the thermometers should be tested. This can be done by placing them in a dish of warm water at a temperature of about 100 degrees Fah., standing them all at the same depth. If a tested thermometer is not at hand to put in with them, it can be taken that if the majority register the same they are correct and the others are defective.

Disinfecting Incubators.

Before starting the incubators each season it is advisable to cleanse the trays and woodwork inside with a cloth dipped in disinfectant. The machines may then be fumigated by placing in them ½ oz. of permanganate of potash in a dish, and pouring over it 2 oz. of formalin. The fumes should not be inhaled. The quantities stated are sufficient for incubators up to 400-eggs capacity, for those over that capacity the amounts should be increased proportionately.

Preparing the Brooders.

On many farms after the rearing season is over the brooder houses are cleaned out in the ordinary way and left till the next season before any disinfecting is done. The outside runs, too, are often left uncleaned until the brooders are required again. In such cases the pens are not in a proper

sanitary condition, which is so necessary to secure the best results in rearing. Even though no sickness has been experienced among the chickens, it should be made a regular practice to clean up and disinfect the brooders and brooder houses thoroughly as soon as possible after the season is over.

The best procedure to adopt is to take out any movable parts of the brooders and scrub them, then spray the brooders and inside the shed with a strong disinfectant. After this, flush down the floors and scrub them clean with a bass broom. The brooder houses should then be left empty until the following season. A few weeks before they are required again they should be given another disinfecting and, when dry, flushed out with clean water. The runs outside should also be given another cleaning up. By doing this the chickens are given a good start in fresh clean pens.

A practice observed on some farms, but which must be condemned, is the use of the brooder pens for housing sick birds and even broody hens, &c. This is only inviting trouble as the pens are likely to become infested with vermin, or the practice is likely to result in sickness breaking out among the chickens.

The water vessels and feeding troughs, &c., should also be cleaned and disinfected before the season commences.

Brooding Chickens.

The rearing of chickens constitutes the most important phase of poultry farming, because the future success of any farm depends upon the ability of the farmer to rear strong vigorous chicks. Yet many poultry farmers are content to carry on with unsatisfactory equipment for rearing the chickens, whilst they spend money on other less important buildings and appliances. The result is that, even though there may not be excessive mortality in rearing the chickens, they lack the desired development. This in turn has a tendency to lower the standard of physique of the resultant birds, and the effect is also seen in the size of eggs and in reduced production. Therefore, every endeavour should be made to instal the best brooding system possible. The question as to which system to adopt is one that depends upon circumstances, but in choosing an installation there are many points to be kept in mind. Only brooders which have proved to be consistently efficient should be entertained, an experience over a year or two is useless and cannot be taken as reliable.

It can be laid down as a sound principle that the greater the number of chickens run together in a brooder the more is the risk of heavy losses, and the less uniform will be the development, while greater skill is necessary for their management. One of the chief essentials in any heated brooder is to be able to maintain a temperature during the coldest weather sufficient to prevent the chickens packing together, and yet provide ample ventilation. Upon this depends success or failure in rearing.

The hot-water circulating system in use on the poultry sections of Departmental farms has proved successful year after year under all conditions, and the development attained is unsurpassed on any farm. These sections are open to inspection by farmers desiring information, and who wish to see the system in use and note the results. The hot-water circulating system of brooding has also given satisfactory results on numerous private farms where it has been correctly installed, but, unfortunately, there are cases where departures have been made from the plans, and these have caused trouble in working and have been responsible for indifferent results. Thus, in some instances the system has been condemned, whereas the fault lies not with the system, but in the alterations that have been made, or some point that has been overlooked during installation. If cases where trouble is experienced were brought under notice, a visit could be arranged in most instances and any defects pointed out.

Plans and particulars of brooders and other buildings, &c., are available on loan upon application to the Department of Agriculture.

Feeding Experiments with Smutted Wheat.

From time to time the question has been raised as to whether wheat bunt has any detrimental effect on poultry, and with a view to determining this point experiments have been carried out by the Department on two different occasions. The first experiment extended over a period of approximately three months, from June to August, 1924, when two pens of ten Langshan pullets were fed on smutted wheat for the evening feed, and were given a morning mash containing bunt-infested wheat cleanings. A check pen of ten Langshan pullets was fed on the ordinary ration used on the farm. The test showed that whilst there was no detrimental effect on the health of the birds, the egg production was lower from the bunt fed pens, the comparison being 301 and 279 eggs from these pens and 369 from the check pen.

A further test over a period of ten months was concluded last month. The birds used in this experiment were White Leghorn pullets. Two pens of ten birds each were fed on an average sample of bunt-infested wheat for the evening feed and were given the usual wet mash in the morning mixed with 10 per cent. of cleanings from bunt-infested wheat. Two pens of the same class of pullets were used for check pens and these were fed on the ordinary ration, which was the same as the bunt fed pens, except that the bunt material was omitted. The results were as follows :—

	Bunt Fed Pens.		Check Pens.
Pen 1	... Laid 1,341 eggs.	Pen 1	... Laid 1,575 eggs.
„ 2	... „ 1,240 „	„ 2	... „ 1,332 „
Total	... 2,581 eggs.		2,907 eggs.

This shows that a total of 326 eggs more were laid by the check pens, although one of the bunt fed pens laid nine more eggs than one of the check pens.

There appeared to be no difference in the health of the birds in any of the pens throughout the test. Whilst further experiments may be necessary before coming to a definite conclusion, it would appear that the feeding of an average sample of bunt-infested food has some detrimental effect upon egg production, but has no ill-effect upon the health of the birds. The effect on production may be due to some action by the smut, or to the additional amount of inert material in the ration. At any rate the results go to prove the wisdom of feeding only good clean and wholesome food to the birds.

Tubercle-free Herds.

Of the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number tested.	Expiry date of this Certification.
J. F. Chaffey, Glen Innes (Ayrshires)	58	2 June, 1929
Lunacy Department, Parramatta Mental Hospital	97	6 „ 1929
E. P. Perry, Nundorah, Parkville (Guernseys)	26	12 „ 1929
F. W. Hopley, Leeton	25	14 „ 1929
P. F. Mooney, Calala	33	16 „ 1929
Department of Education, Gosford Farm Homes	16	16 „ 1929
William Thompson Masonic School, Baulkham Hills	29	23 „ 1929
Dominican Convent, Moss Vale	4	26 „ 1929
Sacred Heart Convent, Bowral	10	21 July, 1929
St. Patrick's College, Goulburn	8	26 „ 1929
Presbyterian Ladies College, Goulburn	4	26 „ 1929
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	42	9 Aug., 1929
Kyong School, Moss Vale	2	21 „ 1929
Department of Education, Mittagong Farm Homes	34	23 „ 1929
Blessed Chanel's Seminary, Mittagong	4	25 „ 1929
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	75	25 „ 1929
Walaroi College, Orange	5	30 „ 1929
Riverstone Meat Co., Riverstone Meat Works, Riverstone	121	5 Sept., 1929
J. L. W. Barton, Wallerawang	22	11 Oct., 1929
W. McLean, Unanderra	44	1 Dec., 1929
Department of Education, Brush Farm, Eastwood	8	5 „ 1929
Lunacy Department, Morisset Mental Hospital	21	7 „ 1929
J. Davies, Puen Buen, Scone (Jerseys)	39	12 „ 1929
Kinross Bros, Minnamurra, Inverell (Guernseys)	73	14 „ 1929
Lunacy Department, Callan Park Mental Hospital	22	19 „ 1929
Miss Brennan, Arrankamp, Bowral	14	20 „ 1929
E. S. Cameron, Big Plain, Narandera	39	10 Jan., 1930
A. Shaw, Barrington	36	11 „ 1930
Lunacy Department, Rydalmere Mental Hospital	68	11 „ 1930
G. A. Parrish, Jerseyland, Berry...	77	12 „ 1930
New England Girls' Grammar School, Armidale	22	16 „ 1930
G. Miller, Casula	15	1 Feb., 1930
Queanbeyan Municipality (various owners)	41	1 „ 1930
St. Joseph's Convent, Reynold-street, Goulburn	5	19 „ 1930
St. John's Boys' Orphanage, Goulburn	9	19 „ 1930
St. Michael's Novitiate, Goulburn	5	20 „ 1930
Department of Education, Yanco Agricultural High School	32	28 „ 1930
Lunacy Department, Kenmore Mental Hospital	81	28 „ 1930
St. Joseph's Girls' Orphanage, Kenmore...	9	1 Mar., 1930
Tudor House School, Moss Vale	8	6 „ 1930
Department of Education, Hurlstone Agricultural High School ...	42	10 April, 1930
Navua Ltd., Grose Wold, via Richmond (Jerseys)	10	11 „ 1930
Australian Missionary College, Cooranbong	43	17 „ 1930

—Max Henry, Chief Veterinary Surgeon.

Orchard Notes.

JUNE.

C. G. SAVAGE and H. BROADFOOT.

Pruning.

As pruning is an operation that should be undertaken during June, it may be well to consider the aims the pruner should have in mind.

The main idea in pruning is to develop a strong well-shaped framework. A large crop of fruit not only draws upon the vitality of the tree, but tests the strength of its limbs, and results may be disastrous to the tree if the limbs are allowed to grow excessively, or if the tree is allowed to bear a crop of fruit before the limbs have become sturdy enough to carry the burden. No desire for early gain should ever tempt the orchardist to allow the tree to carry and to mature a heavy crop at the expense of the tree's well-being.

It is difficult, if not impossible, to lay down any general rules with regard to pruning beyond this: that the pruner must study the chief characteristics of each tree of each kind of fruit. Old apple and pear trees bear most of the fruit on fruit spurs, while peaches bear their fruit on last year's growth. Plainly, the pruner must consider these and other distinguishing characteristics and ply his secateurs accordingly. Old apple and pear trees sometimes develop crowded spurs and thinning out is essential.

The pruner must also consider factors which influence the growth and development of the tree. These factors include the mechanical condition and chemical composition of the soil, the character of the stocks, location, climatic influences, manuring, cultivation and spraying, all of which play their parts in tree development, and every one of these factors must be considered by the judicious pruner. Each tree has its own individuality. The pruner's aim is tree symmetry, tree health and tree wealth, and he must prune accordingly.

Most growers are fully acquainted with the main objects of pruning, but it may be well to recount them here. Good pruning lends itself to the economical working of an orchard in all its branches—cultivation, spraying, picking. It aids in the production of good bearing wood and in improving the appearance of the fruit in so far, at least, as size and colour are concerned—by no means negligable factors in the marketing of fruit. It helps to secure regular cropping and to maintain the tree in a healthy condition; it opens up the main axis of the tree to the influences of the sun's warmth and light; it gives to an orchard that well-cared-for appearance which is by no means a small source of satisfaction to the orchardist who takes a pride in his handiwork and in its results.

Planting.

Orchardists are well aware that the root-growth of deciduous trees is anterior to the above-ground growth, which is awakened by the advent of spring, and it is therefore advisable to plant such trees during early winter. If planting is delayed until late in the season the tree experiences a check, the result of the shock received at time of transplanting; consequently there is a waste of plant energy, and time is lost whilst the vital forces of the tree are being renewed. Planting must perforce be postponed if the soil is dry until such time as rain has made up the deficiency of moisture in the soil. Trees, like other members of the vegetable world, can absorb plant food only when it is in solution.

Trees received from the nursery should be accepted only after they have been very carefully examined and found to conform to a reasonable standard as regards vigour, all-round development and freedom from fungi and insect pests.

The depth at which the tree should be planted is the depth at which it grew in the nursery. Dry, hot, windy days are unsuitable for planting, and if such weather conditions are unavoidable, dipping the tree roots in a clayey puddle will afford a certain amount of protection. Trees which pass rigid inspection should, whilst awaiting planting, be placed in a trench and their roots covered by fine moist soil.

Powdery Mildew.

During winter pruning, the burning of apple twigs affected with powdery mildew will greatly help in keeping this fungus in check. Spraying with dritomic, atomised or colloidal sulphur should follow. Miscible oil should be used for spraying trees infested with San Jose scale, and apple trees infested with woolly aphis should be sprayed with tobacco wash. A good pressure is essential in order to break up the clusters of aphides.

Ploughing.

During this month ploughing may be started. The advantages are three-fold—it puts the soil in a condition to absorb the maximum amount of winter rain, conserves soil moisture, and ensures rapid decomposition of ploughed-in weeds. Winter ploughing is a practice which ameliorates the ill-effects of a dry spring.

When weather interferes with outdoor work the implement and tool shed offers a wide and useful field of activity for the industrious orchardist.

THE world's total recorded wheat acreage is about 280,000,000 acres.

Europe, as a whole (including the Russian Union of Socialist Soviet Republics in Europe and Asia), accounts for about 45 per cent. of the world's wheat acreage, and North America for 28 per cent. Asia, so far as records go, appears to be responsible for about 12 per cent. of the total acreage, and South America for 7 per cent. Africa, chiefly in the north, and Oceania, mainly Australia, account in equal proportions for the remaining 8 per cent. About 90 per cent. of the total acreage lies in the Northern Hemisphere.

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Vol. XL. Part 7. July 1, 1929.

Agricultural Gazette of New South Wales.

Early Tomato Trials.

Variety and Manurial Experiments, 1928.

J. DOUGLASS, H.D.A., H.D.D., Agricultural Instructor.

A series of experiments, designed with the object of gaining further detailed information on different phases of early tomato-growing, was carried out in co-operation with the following growers during 1928:—

A. E. Johnson, Green Valley, *via* Liverpool.
T. W. Brown, Cardiff.
Messrs. Sorby and Kershaw, Macquarie Fields.
H. Eastwood, Tascott.

Growers of early tomatoes are burdened with a heavy capital outlay and are faced with many cultural problems comparatively new to the general agriculturist, while fresh difficulties in disease and insect pest control arise every few years. The results of the experiments herein recorded and the experience gained each year by the Department are greatly helping towards success.

It was very encouraging to find every experimenter taking a great interest in all trials, the detailed reports and records of weighings made by them being sufficient evidence of the value these men place on the results of these experiments. Field observations, combined with actual results, are the facts on which conclusions are made. Market prices were accurately kept and averages made on which to base the monetary returns.

The value of these trials can well be illustrated by the experience of Mr. H. Eastwood, one of our leading tomato-growers. Owing to the small area of land worked, this grower finds it most difficult to practice a long rotation. During the past season the dry conditions, coupled with a water shortage, and the conditions previously mentioned were factors responsible for a big percentage of disease throughout the crop. The chief disease was "sleepy wilt," or fusarium, which caused a high percentage of loss in all varieties, with the exception of Marglobe. This variety, which is reported to be resistant to fusarium, produced an excellent crop of high-quality fruit. Mr. Eastwood has now definitely decided to make Marglobe his main variety. If his last crop had been all of this variety a very much greater monetary return would have been obtained. Other growers have also made drastic changes not only as regards varieties and fertilisers, but also as to cultural methods, largely as a result of these experiments and on Departmental advice.

All the farmers who co-operated in last year's trials practised the single stalk staking system, and closely followed the Departmental recommendations regarding the use of hot frames, preparation of the seed-bed, and general field working. Messrs. A. E. Johnson and T. W. Brown used overhead irrigation systems, while the other growers made use of the furrow system. Mr. A. E. Johnson and Messrs. Sorby and Kershaw are connected with the city water supply, and use it in the growing of their crops.

The Season.

The past season, although not ideal, has been an excellent one for tomato-growers who practise irrigation. Practically the whole of the period was rainless, and consequently there was little risk of over irrigating. It will be found under average conditions that tomatoes can be more successfully grown without rain, providing irrigation is available. In normal years watering in the early stages of growth has not always been desirable or necessary owing to the amount of moisture stored up in the soil from the winter rains, and also because of the danger of reducing the soil temperature. In the early stages of growth last year the season was abnormally warm, resulting in the rapid drying out of the soil and the unseasonable growth of the plants. This caused growers to resort to early irrigation, which, owing to the dry conditions, had to be continued right throughout the growing period. Two very disastrous windstorms swept through the metropolitan

Mr. T. W. Brown's Farm at Cardiff in the Newcastle District.
Note the staked tomatoes in the background.

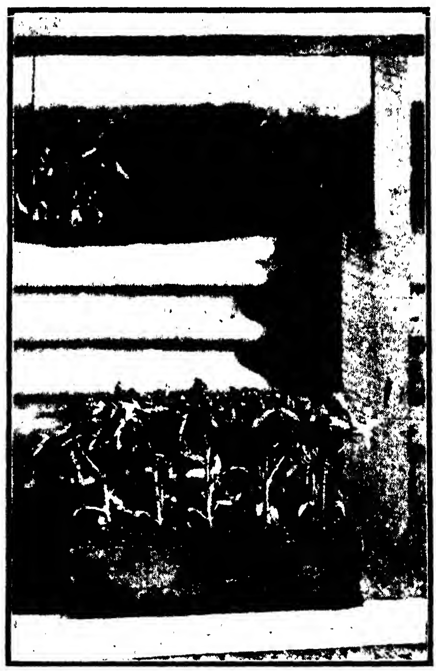
area, burning the foliage of the crop and causing great loss of flowers and young fruit. This experience has taught growers the value of windbreaks where the growing of staked crops is undertaken.

There was a marked absence of insect pests in the early crop, although aphides were very prevalent in the unstaked main crops. Generally speaking, all diseases were very bad, in many cases crops were seen with over 90 per cent. of the plants affected by spotted wilt. As a result of the dry conditions, and, in many districts, an acute water shortage, black spot was prevalent. It can be stated that in the Liverpool, Macquarie Fields and Cardiff experiments under 2 per cent. of the plants were wilted. This is largely the result of correct cultural methods, coupled with adoption of the usual preventive methods recommended by the Department.

Although no exceptionally high prices were realised for tomatoes this year, the season was one of the most satisfactory experienced. The price obtained for the first early tomatoes was about £1 per half case, and the average price throughout the season was very good. No gluts were experienced, and good quality fruit commanded a high price right throughout.

Soils.

The soil on Mr. T. W. Brown's farm at Cardiff, in the Newcastle district, is typical of many portions of the better-class ridge country found between the rivers on the central and north coast of New South Wales. As with all these soils, a good deal of variation is noticed, but generally speaking it can be classed as a brown loam of open texture, with gravel and broken stone distributed through it. Large patches of heavy red clay, strewn with pebbles, &c., are to be found. Providing this heavy soil is elevated, good tomatoes can be produced on it if correct methods are adopted. The better-class loamy soil has a good clay subsoil at various depths.



Seedlings Ready for Transplanting.

Messrs. Kershaw and Sorby's experiment was carried out on an excellent piece of brown loam of good texture and fertility. The land, which is situated at Macquarie Fields, was well elevated, with a north-easterly aspect, and was nicely drained. There is a clay subsoil at various depths throughout the block.

Mr. A. E. Johnson, of Green Valley, in the Liverpool district, has a property which contains many types of soil. The best portions are medium brown loams overlying a red and white clay subsoil. This subsoil sometimes comes to the surface and in parts takes the place of the soil. A good deal of ironstone is found in various portions of the locality. The heavier types of soil are rather difficult to work and are of poor fertility. They are not readily drained except when the position is elevated, but all the same they produce excellent tomatoes of high quality under correct treatment. Lime has a very beneficial effect on these soils.

Fertiliser Trials.

Fertiliser trials were carried out during the past season with the object of ascertaining the correct amount of fertiliser and the mixture that gives best results with the tomato crop. In some cases top-dressing was carried

RESULTS of Fertiliser

	Average price over period.	M22 Mixture (560 lb. per acre).		P11 Mixture (653 lb. per acre).		P12 Mixture. (653 lb. per acre).	
		Cases. lb.	Value.	Cases. lb.	Value.	Cases. lb	Value.
	s. d.		£ s. d.		£ s. d.		£ s. d.
							Messrs. Kershaw and Sorby,
2 December	12 0	75 0	45 0 0	69 12	41 14 0	90 19	54 9 6
16 ,, ...	10 6	368 18	193 11 10	290 0	152 5 0	327 18	172 1 4
31 ,, ...	10 0	574 16	287 6 8	393 16	196 16 8	455 12	227 15 0
Later	7 0	277 12	97 2 6	123 18	43 6 3	157 12	55 2 6
Total	......	1,295 22	623 1 0	876 22	434 1 11	1,031 13	509 8 4
							T. W. Brown,
19 November	13 0	15 2	9 16 1	7 16	4 19 8	24 0	15 12 0
2 December	12 0	102 14	61 11 0	136 9	81 16 6	110 2	66 1 0
16 ,, ...	10 6	300 18	157 17 10	306 6	160 15 7	303 1	159 2 1
31 ,, ...	10 0	349 6	174 12 6	410 9	205 3 9	260 2	130 0 10
Later	7 0	220 12	77 3 6	290 7	101 12 0	226 5	79 3 5
Total	...	988 4	481 0 11	1,150 23	554 7 6	923 10	449 19 4
							A. E. Johnson, Green
4 November	15 0	29 4	21 17 6	22 22	17 3 9	20 20	15 12 6
19 ,, ...	13 0	214 14	139 9 7	231 6	150 6 3	177 2	115 1 7
2 December	12 0	297 22	178 15 0	385 10	231 5 0	297 22	178 15 0
16 ,, ...	10 6	306 16	161 0 0	431 6	226 8 1	306 16	161 0 0
31 ,, ...	10 0	268 1[illegible]	134 7 6	316 16	108 6 8	233 8	116 13 4
Later	7 0	64 14	22 12 1	35 10	12 8 0	41 16	14 11 8
Total	......	1,181 16	658 1 8	1,422 22	745 17 9	1,077 14	601 14 1

*Fertilisers in this plot were sown at double the amount of the two other plots. Top dressings
NOTE.—M22 fertiliser mixture contains equal parts of superphosphate and bonedust; P11 contains
sulphate of potash; P13, 6 parts superphosphate, 1 part sulphate of ammonia, and 1 part sul

RESULTS of Variety

	Average price.	Bonny Best.		Marglobe.		Chinese (Forbes).	
		Cases. lb.	Value.	Cases. lb.	Value.	Cases. lb.	Value.
	s. d.		£ s. d.		£ s. d.		£ s. d.
							A. E. Johnson, Green
4 November	15 0	25 0	18 15 0	4 3	3 3 9	54 2	40 12 6
19 ,, ...	13 0	232 22	151 7 11	135 5	87 17 8	193 10	125 14 4
2 December	12 0	301 14	180 19 0	305 23	183 11 6	178 21	107 6 6
16 ,, ...	10 6	361 21	189 19 8	395 5	207 9 8	235 0	123 7 6
31 ,, ...	10 0	251 16	125 16 8	243 9	121 13 9	176 21	88 8 9
Later	7 0	68 15	23 19 9	60 8	21 2 0	66 13	23 5 3
Total	......	1,241 16	690 18 0	1,144 5	624 18 4	904 19	508 14 10
							T. W. Brown,
4 November	15 0	62 10	46 16 8	4 20	3 12 6	16 8	12 5 0
19 ,, ...	13 0	214 10	139 7 11	63 5	41 1 11	153 14	99 16 7
2 December	12 0	203 5	121 18 6	166 10	99 17 0	197 12	118 10 0
16 ,, ...	10 6	316 20	166 6 8	230 0	120 15 0	278 10	146 3 0
31 , ...	10 0	59 5	29 12 1	89 14	44 15 10	48 0	24 0 0
Total	......	856 2	504 1 5	554 1	310 2 8	693 20	400 14 1
							Messrs. Kershaw and Sorby,
2 December	12 0	93 10	56 1 0	68 6	40 19 0	87 12	52 10 0
16 ,, ...	10 6	343 0	180 1 6	109 5	57 6 8	267 18	140 11 2
31 ,, ...	10 0	537 6	268 12 6	602 0	301 0 0	572 14	286 5 10
Later	7 0	301 0	105 7 0	388 12	135 19 6	215 6	75 6 9
Total	......	1,274 16	610 2 0	1,167 23	535 5 2	1,143 2	554 13 9

Trials with Early Tomatoes.

	P13 Mixture (746 lb. per acre).		Superphosphate (560 lb. per acre).		Superphoshpate (10 cwt. per acre).		H.A.C. Mixture (746 lb. per acre).		H.A.C. Mixture (1,000 lb. per acre).	
	Cases. lb.	Value.	Cases. lb.	Value.	Cases. lb.	Value.	Cases. lb.	Value.	Cases. lb.	Value.
		£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.
Macquarie Fields.										
	60 19	36 9 6	80 0	48 0 0	78 18	47 5 0	39 18	23 17 0	65 19	39 9 6
	200 12	105 5 3	250 6	131 7 7	291 19	153 3 9	244 6	128 4 7	266 6	139 15 7
	468 18	234 7 6	362 12	181 5 0	380 0	190 0 0	480 0	240 0 0	379 9	189 13 9
	178 5	62 7 5	152 12	53 7 6	164 5	57 9 5	193 18	67 17 3	150 0	52 10 0
	908 6	438 9 8	845 6	414 0 1	914 18	447 18 2	957 18	459 18 10	861 10	421 8 10
Cardiff.										
	16 6	10 11 3	4 7	2 15 8	9 1	5 17 6	......	......	......	......
	125 4	75 2 0	137 6	82 7 0	153 1	81 0 6	......	......	.....	......
	300 18	157 17 10	284 6	149 4 7	324 5	170 4 2	......	......	......	......
	226 5	113 2 1	254 1	127 0 5	263 3	131 11 3	......	......	......	......
	297 0	103 19 0	238 7	83 8 0	367 4	128 10 2	......	......	......	......
	[illegible]	460 12 2	918 3	444 15 8	1,116 14	517 3 7	......	......	......	......
*Valley, via Liverpool.**										
	22 22	17 3 9	12 12	9 7 6	14 14	10 18 9	......	......	......	......
	239 14	161 14 1	204 4	132 14 2	187 12	121 17 6	......	......	......	......
	310 10	186 5 0	297 22	178 15 0	291 16	175 0 0	......	......	......	......
	318 18	167 6 10	312 12	164 1 3	360 10	189 4 2	......	......	......	......
	240 15	120 6 3	231 6	115 12 6	237 12	118 15 0	......	......	......	......
	31 16	11 1 8	22 22	8 0 5	29 4	10 4 2	......	......	......	......
	1,163 23	664 4 7	1,081 6	608 10 10	1,120 20	625 19 7	......	......	......	......

of the respective mixtures were also carried out, one-half the original dressing being used.
6 parts superphosphate and 1 part sulphate of ammonia; P 12, 6 parts superphosphate and 1 part phate of potash.

Trials with Early Tomatoes.

	Landreth's Earliest.		Chalk's Early Jewel.		Earliana (Feibus).		Pink Queen.		Money Maker.	
	Cases. lb.	Value.	Cases. lb.	Value.	Cases. lb.	Value.	Cases. lb.	Value.	Cases. lb.	Value.
		£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.
Valley, via Liverpool.										
	8 5	6 6 3	12 12	9 7 6	8 5	6 6 3	......	......	......	......
	187 5	121 13 8	187 5	121 13 8	208 0	135 4 0	......	......	......	......
	272 12	163 10 0	287 1	172 4 6	359 20	215 18 0	......	......	......	......
	282 21	148 10 2	314 2	164 17 10	378 14	198 15 1	......	......	......	......
	232 22	116 9 2	232 22	116 9 2	222 14	111 5 10	......	......	......	......
	29 3	10 3 10	52 0	18 4 0	58 6	20 7 6	......	......	......	......
	1,012 20	566 13 1	1,085 18	602 16 8	1,235 11	687 16 8	......	......	......	......
Cardiff.					Earliana. (A. E. Johnson.)					
	......	......	......	......	53 14	40 3 9	4 0	3 0 0	......	......
	......	......	......	......	227 5	147 13 11	77 12	57 17 0	......	......
	......	......	......	......	281 14	168 19 0	136 0	81 12 0	......	.....
	......	......	......	......	396 20	208 6 9	156 20	82 6 9	......	......
	......	......	......	......	185 14	92 15 10	65 14	32 15 10	......	......
	......	......	......	......	1,144 19	657 19 3	439 22	257 11 7	......	......
Macquarie Fields.										
	45 12	27 6 0	61 6	36 18 0	......	......	29 18	17 17 0	96 6	57 15 0
	413 0	216 16 6	336 0	176 8 0	......	......	318 12	167 4 3	304 12	159 7 3
	388 12	194 5 0	546 0	273 0 0	......	......	470 18	235 7 6	532 0	266 0 0
	320 6	112 1 9	385 0	134 15 0	......	......	245 0	85 15 0	565 6	197 16 9
	1,167 6	550 9 3	1,328 6	621 1 0	......	......	1,064 0	506 3 9	1,498 0	680 19 0

out with the idea of ascertaining the effect of this practice on the yield. The same growers who conducted variety trials also carried out manurial experiments, this being the first complete series of manurial trials with tomatoes, and consequently the results obtained are of great interest and value.

It is usually accepted that the tomato crop is a heavy feeder and requires an abundance of readily available plant food and water. In the growing of early tomatoes early maturity of the fruit is the first consideration. It has been proved that physical composition of the soil and location are of greater importance than soil fertility. And in this connection it is interesting to note that, generally speaking, the most suitable soil available for early tomato production on the central coast of New South Wales is only of medium quality, and in many cases of very poor fertility. The ideal soil condition for early tomatoes is a free working loam, overlying a clay subsoil, elevated, frost free, and with a northerly aspect. The soil should be capable

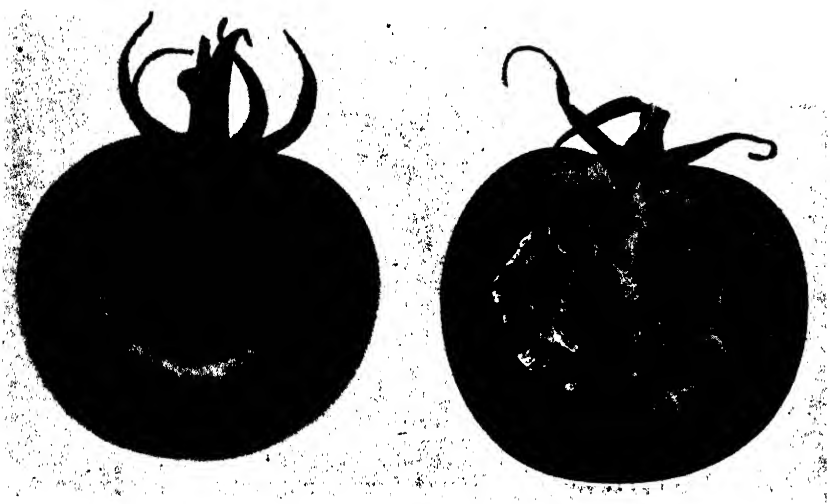
Experiment Plots on Mr. T. W. Brown's Farm at Cardiff.

of being readily drained, and should be protected from the west and south. Soils of this nature are usually only of medium fertility and require artificial fertilisers in order to produce maximum results. As a matter of fact, it would be a very risky undertaking under normal conditions to attempt to grow tomatoes commercially without fertilisers. The Department of Agriculture strongly recommends the use of artificial fertilisers, and hence the unfertilised plots were thought to be unnecessary and were not included in the experiments.

The most practical methods and proper time to apply fertilisers to the soil are often not known to the farmer. A light application of superphosphate to the soil that is to be used in the hot frames and seed-beds will give excellent results. This light application promotes root growth, makes the ratio of phosphoric acid to nitrogen in the soil—nitrogen is often present in too great a quantity—more nearly correct, and results in a more sturdy and healthy growth of the tomato plants.

The main application of fertiliser is made in the following manner. Light drills are ploughed through the field, the distance between the drills being the distance apart which it is desired to transplant the seedlings. Along this drill the fertiliser is distributed at the required rate, and later worked into the soil by means of a strawberry cultivator or other suitable implement. By applying fertiliser in this manner it is localised and yet is not so concentrated as to be harmful, and is so distributed that the roots of the plants can reach it easily. Later on when the plants develop, and it is desired to give them another application of fertiliser, broadcasting can be carried out along the rows of plants and worked in with a light cultivation.

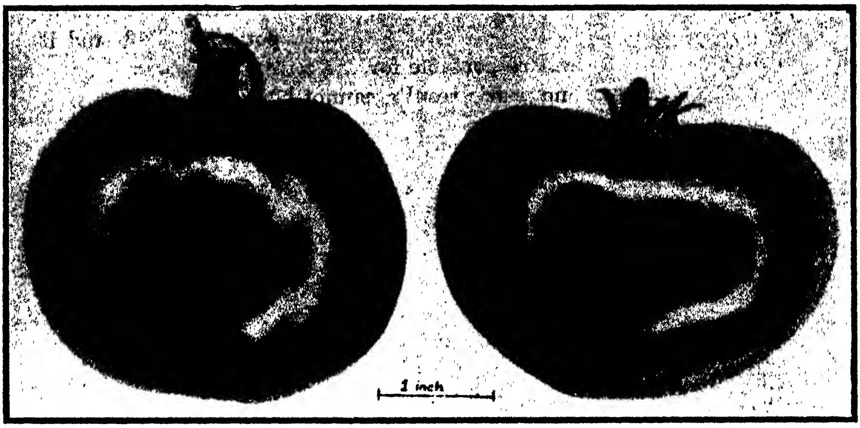
In every instance the fertiliser was distributed along the drills just before transplanting as previously described.



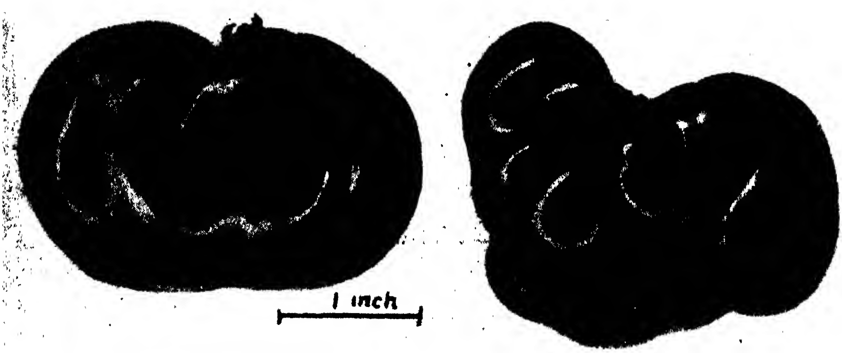
Bonny Best.
Note the high quality, solid flesh of the cut fruit.

A. E. Johnson, Liverpool.—This trial was top-dressed throughout on 10th October, 1928, with an amount equal to one-half of the original application. The two superphosphate-treated plots were not top-dressed, the object being to ascertain if it paid to make one heavy application of superphosphate or to apply the same amount of fertiliser in two applications. The heavy application (1 ton per acre) was all applied at time of transplanting. In the case of the other plot, an amount of 10 cwt. was distributed at transplanting time, and a similar amount at the time the other plots were top-dressed. Double the quantities of fertiliser mixtures were used in this as compared with other districts, owing to the fact that heavy applications have always given excellent results in this locality. The yields in this particular experiment are generally much heavier than those obtained in the other trials, and this may to some extent be due to the heavy applications of fertiliser.

P11 fertiliser mixture (6 parts superphosphate and 1 part sulphate of ammonia) again produced the heaviest yield, 1,422 cases 22 lb., valued at £745 17s. 9d., being obtained. The increased return per acre as compared with the next heaviest yielding plot was £81 13s. 2d. P13, a complete fertiliser mixture containing the same amount of nitrogen and phosphoric acid as P11, produced the next heaviest yield of 1,163 cases 23 lb., valued at



Marglobe. **Sunnybrook Earliana.**



Chinese Varieties, Showing Variation in Different Strains.
The fruit on the left is of good, and that on the right of undesirable, shape and quality.

£664 4s. 7d. M22, a mixture of equal parts of superphosphate and bonedust, which also contains a small percentage of nitrogen, produced an increase in yield over superphosphate alone. When the superphosphate was applied in two equal quantities and at different times as previously stated, an increase was recorded as compared with the trial in which the whole of the superphosphate was applied in one amount prior to transplanting.

The results of this trial indicate that phosphoric acid and nitrogen are the two most important plant foods to apply to early tomatoes in the Liverpool district. The three plots which produced the top yield were treated with fertilisers containing these ingredients, and the greater the proportion of nitrogen to phosphoric acid the heavier was the yield. The addition of potash to superphosphate, as in the P12 mixture, produced a definite decrease in yield when compared with superphosphate alone. The fertiliser mixtures P11 and P13 are identical, except for the addition of potash in P13, and it would seem that the potash was responsible for the decrease in yield as compared with P11. Although one year's results cannot be taken as conclusive, the use of potash in two instances in this experiment resulted in definite decreases in yield, and this should make growers cautious as regards the use of complete fertiliser mixtures containing a high percentage of potash. On the other hand, the trials demonstrated that the use of phosphoric acid and nitrogen in correct proportions gave payable increases in yield.


Marglobe Plant Selected for Seed.
Showing prolific clusters of excellent fruit.

In Mr. Johnson's trials the variety used was Sunnybrook Earliana, and the first fruit ripened on 15th October.

T. W. Brown, Cardiff.—The amount of useful rain which fell during the growing period was nil. Overhead irrigation was carried out during the whole of the growing period. Cultivation and hoeing were practised after each irrigation, with the object of destroying weeds and conserving moisture. Picking and weighing of the plots were carried out when necessary, usually three times each week during the heaviest yielding period. The first weighing of ripe fruit was made on 19th November, and picking was continued until 25th January, 1929.

A glance at the results will show that P11 fertiliser mixture (6 parts superphosphate and 1 part sulphate of ammonia) produced the remarkable yield of 1,150 half-bushel cases 23 lb. per acre, which, based on ruling market prices, would return £554 7s. 6d. That this crop and the soil on this particular plot respond to heavy applications of artificial manure is shown by the fact that when the dressing of superphosphate was doubled a payable increase in yield was still obtained. Superphosphate applied at the rate of 5 cwt. per acre produced a yield of 918 cases 3 lb., valued at £444 15s. 8d.,

whereas a 10 cwt. dressing gave the second heaviest return—1,164 cases 14 lb., valued at £517 3s. 7d. The addition of potash to superphosphate, as in P12 and P13 mixtures, showed a slight increase in yield, but the addition of nitrogen in P13 was responsible for increasing the yield above that obtained from the P12 plot. A mixture such as P11, which contains only nitrogen and superphosphate, is indisputably the most economical to use if we are to judge from this year's trials. It is rather doubtful if the use of potash under Cardiff conditions is worth while, as the yields obtained with P13 (6 parts superphosphate, 1 part sulphate of ammonia, 1 part sulphate of potash) compare anything but favourably with those from P11. M22 is a mixture of bonedust and superphosphate, and considering that the season was so dry it produced very good results. The presence of a small percentage of nitrogen in bonedust may have had an influence on the yields. In normal years this fertiliser mixture should produce excellent results.

Messrs. Kershaw and Sorby, Macquarie Fields.—These experiment plots, along with a commercial crop, were the first staked tomatoes grown by these partners, and the results reflect great credit on their industry and perseverance. The crop throughout produced fruit of remarkable quality and the yield was exceptionally good. These growers were handicapped by not having an irrigation scheme, and consequently they had to resort to the rather laborious furrow system.

The land, as previously stated, is of excellent quality and of an open nature. A top-dressing of fertiliser was not applied to the growing crop during the past year; this certainly would have given excellent results.

The standard fertiliser mixtures were tried out at Macquarie Fields, also a mixture used at the Hawkesbury Agricultural College, known as the H.A.C. mixture. This mixture contains nitrogen, potash, and phosphoric acid, and comprises several fertilisers. The H.A.C. mixture was applied at the same rate as P13 for comparison, and also at the rate of 1,000 lb. per acre. Two superphosphate-treated plots were also included, one being fertilised at the rate of 5 cwt. and the other at 10 cwt. per acre. It was found that the heavier application produced a decided increase in yield over the 5 cwt. plot. The heaviest yield in the experiment was produced by fertiliser mixture M22, 1,295 cases 22 lb., valued at £623 1s., being harvested. This was £114 in excess of the next heaviest yield. M22 certainly suits the open class of soil, and should give good results in normal years under most conditions if applied to the land previous to transplanting. It must be borne in mind, however, that the bonedust portion is slow in becoming available, and thus makes the mixture unsuitable for top-dressing. It was undoubtedly the slow availability of the bonedust that largely contributed to the heavy yield and high quality of the late-formed fruit of this plot.

The other results obtained from this trial are not easy to interpret, and give some indication of the difficulties to be contended with by a field experimenter. In the two previous experiments, at Liverpool and Cardiff, the addition of potash proved unprofitable. At Macquarie Fields, however, the addition of potash to superphosphate, as in the P12 mixture, produced

the second highest yield. P13, also containing potash, produced a heavier picking than P11. The addition of nitrogen to superphosphate, as in P11 and P13 mixtures, produced an increase over superphosphate alone, but in no way compared with the increase produced by potash. When the dressing of superphosphate was doubled, an increase of 71 half-cases 12 lb., valued at £33 18s. 1d., per acre was obtained. On the other hand, by increasing the dressing of H.A.C. mixture a definite decrease in yield resulted. This decrease was no doubt due to the heavier application of one or more of the chemical plant foods, but owing to the complexity of the mixture and the absence of control plots it is not possible to form any definite conclusions. A comparison of the results obtained from applications of equal amounts of P13 and H.A.C. mixtures shows up slightly in favour of the latter.

Chinese Variety, Showing Fruiting Characteristic of Unpruned Plant.
Note the heavy first bunch.

Variety Trials.

In the variety trial several objects were kept in mind. It has been found that in each locality there is a good deal of variation in soils, climatic and other conditions, and that certain varieties or selections are much better suited than others to those districts. The chief object of the trial was to ascertain the most profitable variety to grow in certain districts. To be most profitable a variety must have the following characteristics:—(1) Early maturity, (2) heavy-yielding capacity, (3) ability to respond to the best cultural methods, (4) ability to produce high-quality fruit, and (5) it should be capable of making healthy and strong growth.

A glance at the accompanying table, which gives the yields and returns per acre from the different varieties in the various districts, enables us to arrive at some definite conclusions.

A number of varieties were placed under trial, but unfortunately in the case of the trials at Liverpool and Macquarie Fields, Sunnybrook Earliana was not included in the variety trials owing to an oversight. In both these cases, however, this variety was used exclusively in the manurial trial, and the averages of these trials can be compared with those obtained in the variety trials. The relative earliness of the various plots is well illustrated by the table of results. Average prices are used in every case, although it is recognised that varieties such as Chinese and pink types do not realise the same market price as the better-quality red tomatoes. The slight advantage derived from taking these varieties in at the average price is of little importance in these trials, except in the case of Money Maker, a pink variety, which produced the highest return at Macquarie Fields.

A Bad Case of "Rosette" Disease.
This disease was very prevalent last season.

Approximate returns per acre worked out at:—Bonny Best, £601; Sunnybrook Earliana, £592; Marglobe, £490; Chinese, £487. Chalk's Early Jewel averaged £611, but from two trials only, and although this variety recorded the heaviest average, it was only included in the trials that produced the heaviest yields.

The varieties which produced the best results under all conditions were Bonny Best and Sunnybrook Earliana. There is little to choose between these varieties for general sowing as an early-staked tomato.

Sunnybrook Earliana.—This selection of Earliana variety has, for a number of years, proved the most suitable for the early crop. The success of this variety largely depends on its improvement by annual selection and correct cultural methods. As this variety is well known, a detailed description is unnecessary.

Bonny Best.—This is a selection from Chalk's Early Jewel, but differs from the original variety in that it is a more robust grower, produces better quality fruit, and is a heavier yielder under all conditions. Perhaps the most outstanding features of Bonny Best are its excellent quality and the deep-red colour of its fruit. It is usually spherical in shape, the flesh being solid, with scanty seed, and a marked absence of white tissue or core. Bonny Best can only be classified as second early-maturing, being a few days later than Earliana. The variety responds well to the single-stalk pruning system, and can be definitely recommended for this work.

Marglobe.—This variety is a crossbred between Marvel and Globe, and is reputed to be resistant to fusarium wilt. All growers were greatly impressed by this variety owing to its hardy constitution and high-quality fruit. It stood up to disease under all conditions, although a number of cases of spotted wilt and rosette were seen in the plots. In the past season's main crop it was also reported to have been affected by fusarium wilt, but this was not seen by the writer. In one locality fusarium wilt accounted for 75 per cent. of the plants of several varieties, while Marglobe was not attacked at all.

This variety, even from the seedling stage, is conspicuous because of its robust growth and healthy appearance. Outstanding characteristics are its deeply-wrinkled heavy foliage and thick stalk. The fruit is inclined to be long, but of excellent shape and quality. The skin is tough and has a slightly mottled appearance on the blossom end. The flesh is very firm. The chief fault with this variety lies in the fact that the fruit cracks rather deeply.

Marglobe is only a second early-maturing variety, but produces high-quality fruit on the top bunches. It is recommended as worthy of trial for early, main, and late crops.

Chinese.—This is a general classification for a group of varieties rather than the name of a single variety. Varieties included in this group are Market Favourite, Atlantic Pride, and Tascott's Early Dwarf. The Chinese variety grown in these trials was one used by Mr. Forbes, of Terrigal.

This tomato is distinctly a dwarf type of poor quality. The most outstanding feature is its earliness, being the first to ripen under average conditions. This is largely due to the flowers being able to ripen their pollen at a lower temperature than other varieties. The foliage is rather fine, light in colour and very much twisted. The first bunches are of enormous size, and always have a prominent malformed flower, sometimes termed a cat-head, in the centre. Growers are recommended to prune off this flower, otherwise the resultant fruit is always very large, of poor quality, very misshapen, and of no commercial value. The average fruit of this variety is very wrinkled, tough, sometimes hollow, with an abundance of seed and a very prominent core. It can, however, be considerably improved by selection, as strains of this variety which yield good-quality fruit are known to be in commercial culture.

Summary of Results of Trials.

The results of these experiments have proved that Earliana and Bonny Best are the two most profitable varieties of tomato to grow for the early crop when the single-stalk staking system is practised. In areas where a long rotation cannot be practised Marglobe should be the variety mostly grown.

By selecting under field conditions the yield, earliness, quality and disease-resistance of all varieties can be improved.

As heavy applications of fertilisers produced the best results last year, which was very dry, it is safe to assume that even better results will be obtained in normal years. The fertiliser trials also demonstrated that tomatoes are heavy feeders and that phosphoric acid and nitrogen are the most important plant foods required by this crop. Nitrogen, if applied too early, results in excessive leaf-growth and the dropping off of the early flowers.

From the results of the trials the Department is able to recommend a dressing of M22 fertiliser mixture at time of transplanting into the field, and a top-dressing of P11 mixture later on when the flowers are set.

LOCALLY MADE FRUIT CASES.

WHILE it is a fact that the importation of the Canadian type of softwood fruit case (in shooks) is a serious obstacle in the way of the manufacture of fruit cases by local saw-millers, it has also to be admitted that fruit-growers are largely of the opinion that the local hardwood case is not as suitable as the more attractive imported softwood article for the marketing of high-class fruit. The dressed ends and smoother sides of the imported softwood case are more suitable for labelling, stencilling, &c., while the elasticity of the top and bottom boards allow for a bulge, which is a factor of no little importance when the fruit has to be carried any distance.

As Australia has no suitable softwood timber available in sufficient quantities that could be used to take the place of the imported softwood for the making of the Canadian type of case, it was decided to ascertain whether cases having local hardwood (coachwood) ends and sides and imported softwood (spruce) tops and bottoms would be as suitable as the imported all-softwood case.

Cases of both types were made up at Bathurst Experiment Farm, packed with apples and pears, and then consigned to the fruit markets in Sydney, where they were inspected by Mr. H. Broadfoot, Special Fruit Instructor, Department of Agriculture, who reported that as far as appearance was concerned the cases having dressed hardwood one-piece ends and sides compared very favourably with the all-pine cases. The dressed hardwood ends showed up the stencilling just as effectively as the dressed pine. As regards the condition of the fruit when it arrived at the markets, there was nothing to choose between the two types of cases, although the all-pine cases did not stand the wear and tear incidental to transit as well as the hardwood-and-pine case. The former had more split ends and drawn nails than the latter. None of the cases of either type was wired.

Apart from a slightly lower cost in favour of the all-softwood case (1s. 2d. as against 1s. 3d.), the case made with hardwood ends and sides and softwood tops and bottoms appears to be at least the equal of the softwood case in all other respects, and superior to it in that the ends are not so liable to split.

Wheat Growing in South Australia.

Some Comparisons with New South Wales.

E. S. CLAYTON, H.D.A., Senior Experimentalist.

DURING recent months considerable interest has been evinced by New South Wales farmers in regard to wheat-growing practices in South Australia, particularly concerning the growing of field peas as a rotation crop in wheat districts. In making any comparison between the methods of farmers in the two States, it is necessary to bear in mind certain dissimilarities in conditions. One of these is the incidence of the rainfall. The rainfall of South Australia is more favourably distributed than that of New South Wales from a wheat-growing point of view. By far the greater proportion of the rain falls in the growing period, and very little is received during the summer. In order that the position may be fully understood, the following particulars are given showing the distribution of the rainfall at Roseworthy, in South Australia, and West Wyalong, in New South Wales, both of which towns have an average annual rainfall of 17 inches :—

	Roseworthy (Average for 42 years).	West Wyalong (Average for 27 years).
	Inches.	Inches.
January	0·79	1·59
February	0·62	1·19
March	0·81	1·37
April	1·47	1·05
May...	1·99	1·43
June	2·59	1·94
July	1·89	1·45
August	2·06	1·41
September	1·95	1·53
October	1·66	1·42
November	1·07	1·41
December	0·87	1·71
Average annual rainfall ...	17·77	17·5

It will be seen at a glance that the New South Wales town receives heavier falls than Roseworthy in November, December, January, February, and March, while during April, May, June, July, August, September, and October the rainfall at Roseworthy is greater than at West Wyalong.

The following table reveals the position that although both towns receive the same annual rainfall (17 inches) only 11·64 inches fall at Wyalong in the growing period, while at Roseworthy 14·65 inches fall in that period, so that while the latter receives 82·44 per cent. of the annual rain in the most effective time of the year from a wheat-growing point of view, Wyalong receives only

66·5 per cent. of its annual rain at that time. Therefore, if it is at any time necessary to compare a district in New South Wales with one in South Australia, it should not be done on an annual rainfall basis. The best basis of comparison to adopt is that of the average total rain falling in the growing period—that is, from 1st April to 30th November. It is on this basis that the suitability of New South Wales districts for pea-growing in conjunction with wheat must be considered, peas being a winter-growing crop.

RAINFALL Distribution (Averages).

——	Seeding rains (April–May).	Winter rains (June–July).	Spring rains (August–Oct.)	Early summer rains (Nov.).	Total useful rain.	Total annual rain.	Percentage of useful to total rain.
	inches.	inches.	inches.	inches.	inches.	inches.	inches.
Roseworthy	3·46	4·48	5·67	1·07	14·65	17·77	82·44
West Wyalong ...	2·48	3·39	4·36	1·41	11·64	17·50	66·5

Wimmera Rye Grass in Rotation with Wheat.

Note the luxuriant growth. The rotation experiment is being carried out at the Waite Research Station, South Australia, and consists of bare fallow, wheat, and pasture (Wimmera Rye grass).

The Use of the Roller.

The roller is used to a greater extent by South Australian farmers than one would expect. Most of the wheat soils are light in texture compared to those of New South Wales, and it is difficult to get good consolidation. Usually the very shallow cultivation is depended on to compact the soil, but it is often found of advantage to supplement the practice by using a roller or culti-packer in some districts. The fallow is rolled in late winter

or early spring while the land is moist—it should not be rolled when dry. The culti-packer is preferred to the ordinary roller because it does not leave the surface so smooth.

Rolling is, of course, only adopted on those soils that lend themselves to the practice without being adversely affected. It destroys the clods, but that is no great disadvantage, as it is not necessary to maintain a cloddy mulch on those particular soils. The land is of such a texture that it does not run together very much after rain; moreover, the summer rainfall in those areas is so scanty that they rarely receive enough rain in summer to set the surface.

The light-textured soils in dry districts are those that usually respond to rolling, but great judgment must be exercised. It is not advisable to roll light sandy soils, as they are very liable to blow and drift, and the heavy soils cannot be rolled as they occur in better rainfall areas and would set down hard after rain; but on many of the soils midway between these two extremes the use of the roller is considerably increasing wheat yields.

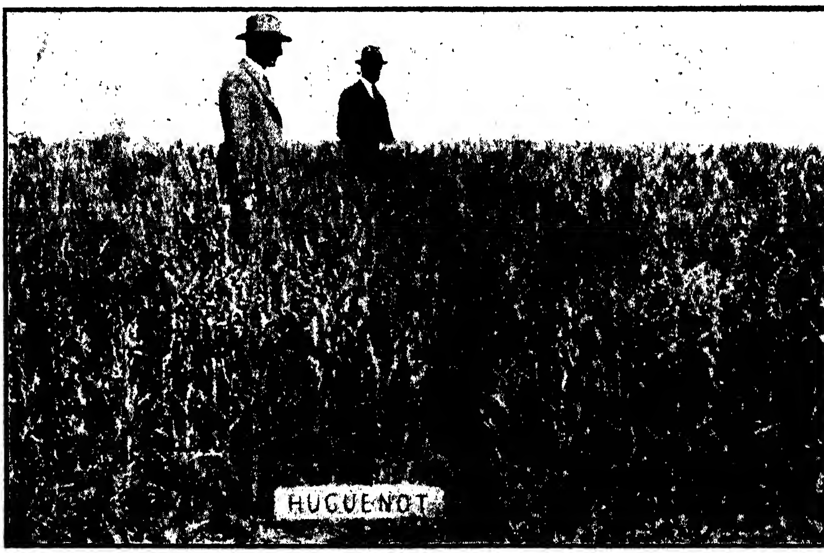
A New Implement.

Much of the pioneering work in connection with wheat-growing in Australia has been done by South Australians, and they are still coming forward with new inventions. The latest is a cultural implement called a spring-tine plough, which is built on much the same lines as a skim plough. The tines are arranged in series of three, ten sets in all, and the machine takes a cut of about 8 feet wide. Narrow points are used on the tines, and there is no share or mouldboard. The machine is only used on the light soils which occur so frequently in South Australia, and which are never worked deeper than 2½ to 3 inches, the advantages being the reduction of draught and the elimination of one operation. It should be understood that in much of this country the plough is closely followed by the cultivator, and by having one implement that practically does both operations at the one time a considerable saving is effected.

Interesting Mallee Practices.

Most of the wheat land of South Australia originally carried mallee, and quite early in its history the State was forced to devote attention to this class of soil. The consequence has been that a harsh, forbidding, and almost waterless tract of country has been transformed into a revenue-producing asset. Most of the soils are light in texture, some of a sandy nature, and some of a powdery calcareous character and containing an excess of lime. The lighter the soil the shallower it is ploughed; the depth rarely exceeds 2½ or 3 inches, and 2 inches is preferred if possible. In many instances these light soils are not ploughed at all, they are simply cultivated. Of course long summer fallowing is universally adopted. All the cultivation is shallow, so that the soil will be consolidated. When take-all is prevalent the ploughing and cultivations are made even shallower, for it is found that apart from a good stubble burn the best way to combat the disease is to give the wheat

every chance by having the seed-bed as compact as possible. On the dry light mallee soils the harrows are not used to any extent, as the soil is likely to blow away when it gets too fine; in fact, the tendency here is to keep the fallows clean by the use of sheep rather than by tillage. Every effort is made to reduce the number of cultivations to a minimum on these soils. Wide points are used on the machines so as to leave the surface ridged. This is the best means of checking severe drifting. There are two classes of soil which drift badly—the sandy type, and the powdery calcareous soils. With both of these it is necessary also to leave the surface ridged as much as possible when sowing so that the young wheat plants will not be cut by the soil being blown along.



A Popular South Australian Hay Wheat.

South Australia is troubled with salt in much of the wheat country on mallee land, but only after a very dry year does the salt rise close enough to the surface to cause damage. While the country is carrying mallee, salt does not seem to appear; it is only after the land has been cultivated for a few years that it makes its appearance. Barley is more tolerant of salt in the soil, and it is often grown when salt becomes troublesome. It is sown late in the season after the autumn rains have washed the salt down to some extent. In the worst cases the land is often left out to pasture for a few years, when the effect of the salt becomes less noticeable.

Some South Australian Problems.

Flag smut of course is very prevalent in the wheat crops and takes a severe toll. Foot-rot, take-all, and rust are present to a slight extent. Eelworms were quite troublesome last season (1928). Rolling the ground was tried

but proved of little use, but feeding the crop off with sheep so that they packed the ground seemed to check eelworms, especially if the ground was moist and in a good condition to pack. The pest chiefly occurs in stubble land and is not so noticeable on crops sown on fallow. White curl grubs do a certain amount of damage on both fallowed and stubble land. They cause more destruction on the lighter limestone soils, where the grubs can apparently move about more readily.

South Australia has a colossal weed problem. Stinkwort is to be seen everywhere. Black oats are present in all the wheat country, but the system of farming is such that they rarely do much harm to the crops. Wheat is always sown late (June), and by that time most of the oats have been induced to germinate and have been destroyed, so that they are rarely found

Dorset Horn Rams Under 1½ Years Old.

This is the breed that helped to make fat lamb raising profitable in South Australian wheat districts.

growing in the wheat crops to any extent. This late sowing, which the peculiar climatic conditions make possible, is also of advantage in avoiding flag smut infection, so that it works to the farmer's advantage in every way. Unfortunately in New South Wales the climatic conditions obtaining over the bulk of our wheat areas are entirely different, and we cannot adopt the system of late sowing. We are in an earlier district and the summer comes in much quicker than it does in South Australia, and June sowing would be disastrous in our main wheat belt.

Hoary cress is proving an exceptionally objectionable weed on wheat country, and is widespread in South Australia. It is very persistent, and although frequently cut off below ground by cultural implements, it still grows up as vigorously as ever and competes with the wheat crop. Tests

in this connection are being carried out by the South Australian Department of Agriculture. Spraying the plants with a 10-per cent. solution of sodium chlorate seems to be giving promising results. The weed is prevalent in Victoria but is not present in New South Wales except in isolated localities in southern Riverina.

Varieties of Wheat.

The leading varieties of wheat grown in South Australia in order of size of areas sown are as follows:—Early Gluyas, Ford, Federation, Currawa, Late Gluyas, Daphne, Caliph, Florence, Major, Queen Fan, German Wonder, King's White, Sultan. It is interesting to note how some of the varieties behave under South Australian conditions of soil and climate.

Much of the wheat land is light in texture and of a calcareous nature, and it has been necessary to some extent to roughly divide varieties into two general groups—those which tolerate the excess of available lime in the soil and those which do not. The Federation types of wheat, including Bena, do not seem to tolerate this combination of lime and light texture. They do best on the red soils, especially those of heavier texture. Gluyas, Canberra, Sultan, Caliph, and Ford are the types that seem to suit the light lime soils. Federation is very popular, occupying third place. It is considered suited to the best wheat districts in South Australia but it is not favoured in the drier areas or where the soil is very light. Canberra does well and is gaining favour. It is reputed to suit the light soils, but takes flag smut. Waratah is not so hardy on the light soils; it does better on those of heavier texture. It does reasonably well on the better class mallee country, where the soils are not too light. Major prefers the heavier soils and must have good finishing conditions to yield well; it does not withstand much hardship. Nabawa is gaining favour on account of its flag smut resistance, and Wandilla and Riverina also are attracting attention as it is found that they are not seriously affected by this disease. Wandilla is doing particularly well on the heavier soils in the better districts. Turvey does well in good districts, Daphne is popular, doing well on the moderately light mallee soils, but on the lightest types it will not do so well as Gluyas or Canberra.

For light soils and low rainfall Gluyas Early, Canberra, and Faun seem to stand out above all other varieties at present; then come Sultan, Caliph, and Felix, but these are not quite so suitable on the very lightest soils, as they are tough to strip and are sometimes pulled up by the harvester. In the mallee districts in light sandy soils Sultan, Caliph, and Currawa seem to be the best varieties, and Canberra also is good. On new mallee soil for the first few crops Ford is often used as it gives a bulky stubble and affords a good burn, which is so essential for destroying mallee suckers.

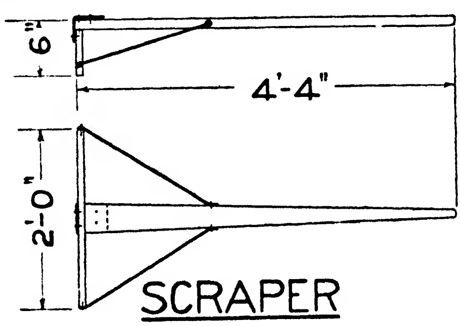
The behaviour of the different varieties of wheat on the mallee lands of South Australia furnishes a useful guide to the settlers on mallee country in New South Wales.

Bulk Handling of Wheat.

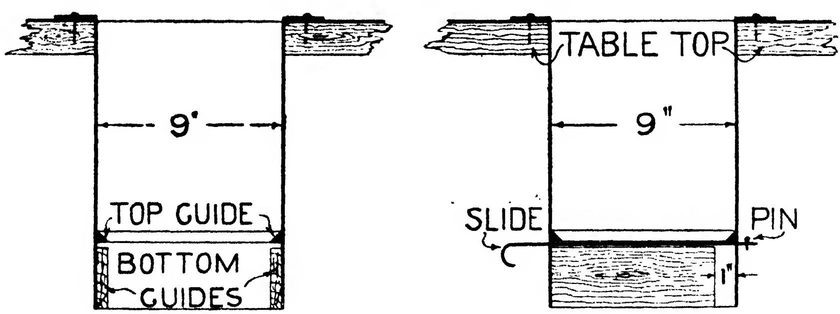
BULK BOX FOR TABLE-TOP WAGON.

J. A. D. MACBETH, Engineer, Government Grain Elevators.

A BOX to take grain in bulk, which any handy farmer can build to place on his table-top waggon, is an accessory which will enable him to reap the full benefits of the bulk-handling system by reducing the number of bags required in transferring his crop from farm to wheat silo. The cost of sewing or clipping the bags is saved, and unloading at the silo can be carried out more easily and quickly.



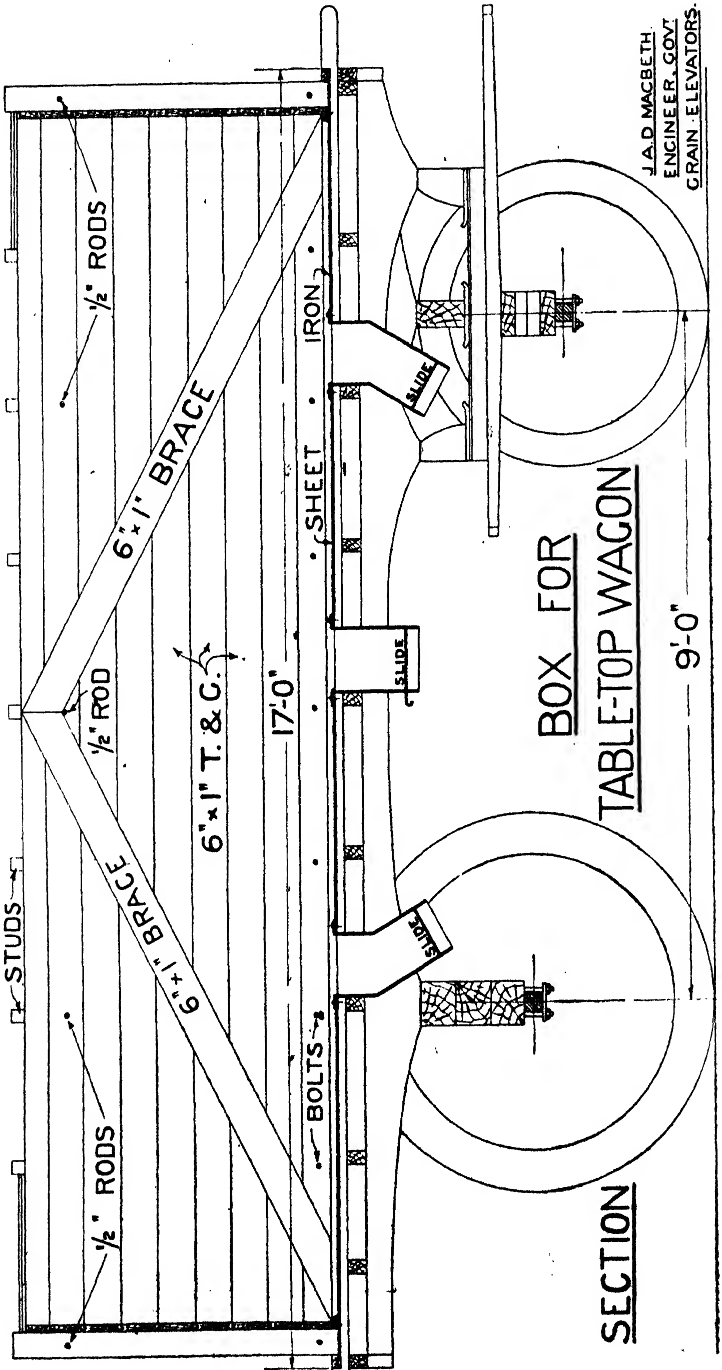
Features to be aimed at are low cost, simplicity, strength, lightness, ease of loading and unloading. Elaborate boxes with sloping bottoms and high sides have been made by some growers, but the weight and cost of such construction is not necessary when three outlets in the floor of the box are used. The small quantity of grain which does not flow out of one or other of the three openings is quickly raked out by means of a scraper of the type illustrated on this page.

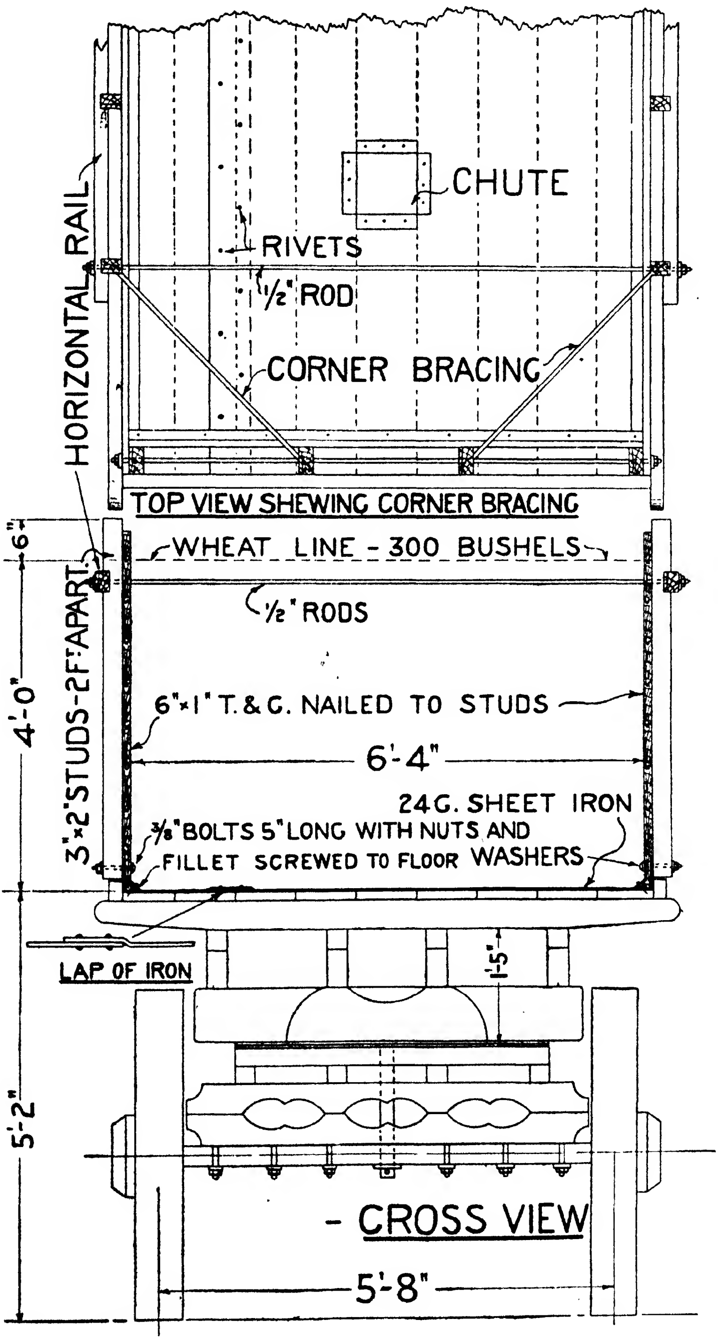


Sections of Outlets, Showing Details of Slides.

In the box illustrated (page 494), sheets of light iron are used to form a smooth flat bottom, and, being turned up at the edges, they hold the two sides against the bursting pressure of the grain at the bottom. If the sheets used are not the full width of the wagon, they can be lapped and riveted as shown on page 495. Laps in the other direction need not be riveted.

The sides of the box can be made of T. & G. boards nailed to the studs, or of iron—plain or corrugated—if desired. If plain iron is used more bracing will be required.


½" RODS
6"×1" BRACE
½" ROD
6"×1" T. & C.
17'-0"
IRON
SHEET
SLIDE
SLIDE
SLIDE
STUDS
BOLTS
½" RODS
6"×1" BRACE
BOX FOR TABLE-TOP WAGON
9'-0"
SECTION
J.A.D. MACBETH
ENGINEER, GOVT
GRAIN ELEVATORS.



CHUTE
RIVETS
½" ROD
CORNER BRACING
HORIZONTAL RAIL
TOP VIEW SHEWING CORNER BRACING
WHEAT LINE - 300 BUSHELS
½" RODS
6"
4'-0"
3"×2" STUDS-2FT. APART.
6"×1" T. & G. NAILED TO STUDS
6'-4"
24G. SHEET IRON
⅜" BOLTS 5" LONG WITH NUTS AND WASHERS
FILLET SCREWED TO FLOOR
LAP OF IRON
1'-5"
5'-2"
- CROSS VIEW
5'-8"

The outlets, as shown in detail on page 493, are located (see page 494) so as to enable the maximum amount of grain to run out without the use of the scraper. Plain iron, or even kerosene tins, can be used to make the chutes. The slides of the chutes are simple and effective, if made as shown, and will not jamb or shake open. They may be made of sheet-iron or timber. The chutes are arranged so as to deliver the grain to the receiving hoppers at any of the silos without tipping the wagon. It will be found that this arrangement of chutes can be used on all wagons except those of very old type which have a perch pole.

Grafting Experiments with Ohanez Vines.

During last spring repeated inquiries were made for information regarding the working over of Ohanez vines to other varieties, and while the Department condemned this method, considering it better to uproot the vines and replant with the desired varieties, a few growers were still of the opinion that the work could be successfully carried out, and consequently this experiment was undertaken.

A plot containing approximately thirty-six well-grown four-year-old Ohanez vines on Mr. J. Davies' property, Farm 1132, Hanwood, was chosen for the experiment, and the vines were sawn off and wedge grafted in the usual manner with Purple Cornichon scions. The vines were grafted on 18th September, when the buds were just bursting into leaf, and two scions were inserted in each stock, after which the grafts were clayed and properly moulded over.

A reasonably good "strike" resulted, but after making about 1 or 2 inches of growth the scions died and a heavy growth of suckers was forced out from the stock, thus proving very conclusively that there is no affinity between the two varieties mentioned and that Ohanez cannot be worked over to Cornichon.—N. D. Lackie, Superintendent, Griffith Viticultural Nursery.

"Pests and Diseases of Queensland Fruits and Vegetables."

Written in a style that will certainly appeal to the non-technical reader, as well as the student of entomology and plant pathology, this book—"Pests and Diseases of Queensland Fruits and Vegetables," by Robert Veitch, B.Sc., F.E.S., and J. H. Simmonds, M.Sc.—should prove popular.

Most space in the book is devoted to a discussion of the commoner pests and diseases of Queensland fruits and vegetables, while other chapters treat briefly with the rudiments of entomology and plant pathology, a knowledge of which will enable the orchardist or market gardener to set about the task of applying control measures more intelligently, and consequently with better results. Not the least valuable feature of the book is the large number of instructive illustrations it contains.

[Our copy from the Department of Agriculture and Stock, Queensland.]

Fallowing Competitions, 1928-29.

SUMMARISED REPORTS FROM VARIOUS DISTRICTS.*

Western District (Parkes Centre).

H. BARTLETT, H.D.A., Senior Agricultural Instructor.

DURING the period 1928-29, fallow competitions were promoted by the Pastoral, Agricultural and Horticultural Associations at Parkes (eight competitors), Condobolin (thirteen), Bogan Gate (twelve), Trundle (four), Forbes (four), and branches of the Agricultural Bureau at Gunning Gap (nine competitors), Nelungaloo (nine), and Alectown (twelve); a total of eight competitions and seventy-one competitors. The Bureau competitions were associated with field day demonstrations and fallow judging contests.

The Season.

The rainfall registration at Parkes for the fallowing period was:—June, 1928, 80 points; July, 259; August, 87; September, 34; October, 130; November, 75; December, nil; January, 1929, 10; February, 121; March, 213; total, 1,009 points.

Bogan Gate rainfall was:—June, 1928, 94 points; July, 186; August, 68; September, 49; October, 136; November, 57; December, nil; January, 1929, 6; February, 171; March, 126; April (till 17th, *i.e.,* time of judging), 135; total, 1,028 points.

Throughout the competitions the total points awarded were considerably lower than those of last year. This is not due to neglect on the part of the farmers, but to the absence of sufficient and opportune rains, which are so essential to the production of an ideal fallow.

From July, 1928, onwards the period was the driest for very many years, and at no centre was the rainfall sufficient to penetrate the subsoil. The subsoil moisture was, therefore, dependent upon the conservation of the rains which had fallen during February and March, 1928, and it was most noticeable that the heavy soils retained the moisture to a greater extent than the lighter, or loamy, soils, provided early fallowing and efficient mulching had been practised. The Parkes and Trundle competitions were judged prior to the early April rains, and were therefore showing a deficiency of surface soil moisture, more so than the fallows judged at a later date.

* Detailed reports of these competitions are supplied each year to the local country papers, and farmers and the Department appreciate the fact that much space is devoted to the publication of these reports.

General Comment.

Generally the moisture content of the subsoils, at depths of 1 to 2 feet, varied from almost dry to medium. A few exhibits of long summer fallow, the land being ploughed or scarified soon after the heavy rains of February, 1928, showed a high subsoil moisture content, demonstrating the effectiveness of such a working. However, it is questionable if the long summer fallow is economical, as valuable grazing is lost from high-priced land for a period of four months. The absence of rains, besides affecting the moisture content, also lessened the opportunities of producing a mellow mulch and a compacted sub-surface soil.

The deficiency of moisture was approximately the equivalent of from 2 to 4 inches of rain, which means the wheat crop of 1929 is starting with a handicap of 6 to 12 bushels per acre when compared with most years, and it is very largely dependent upon the growing period rainfall. The handicap due to shortage of moisture is, however, probably more than counterbalanced by the added soil fertility due to the land having had a rest.

TABLE of Awards.

	First.	Second.	Third.
P. A. and H. Associations—			
Parkes	E. J. Johnson, Wongalea (131 points).	F. A. Patton, Aleetown (119 points).	W. G. Pilkington, Nelungaloo (113 points).
Condobolin ...	L. J. Johnson, Murrumbogie (114 points).	W. O'Halloran, Condobolin (109 points).	J. M. Connor, Ootha, and J. R. Le Strange, Condobolin (105 points each).
Bogan Gate ...	A. W. Mill, Gunningbland (136 points).	R. W. G. Hodge, Gunning Gap (133 points).	E. J. Mill, Gunningbland (132 points).
Trundle	T. E. Kitamura, Trundle (106 points).	Mailer Bros., Trundle (88 points).	S. A. E. Blomfield, Trundle (85 points).
Forbes	B. J. Knpkee, Forbes (137 points).	D. L. N. Miller, Daroobalgie (129 points).	S. E. Sly, Grawlin, and G. W. Blair, Grawlin (123 points each.)
Agricultural Bureau Branches—			
Gunning Gap ...	R. W. G. Hodge (123 points).	W. Scott (119 points).	W. Scott (115 points).
Nelungaloo ...	W. G. Pilkington (138 points).	W. B. Cheney (135 points).	E. J. Johnson (134 points).
Aleetown	F. A. Patton (122 points).	F. Attenborough (121 points).	M. A. Barton (120 points)

An interesting fallow was that exhibited by Mr. George Mill, of Gunningbland. This farmer's soil is a black, self-mulching clay loam, and it was ploughed to a depth of 5 inches in July, 1928, being subsequently worked five times. Such soils, when ploughed deeply, are difficult to compact. The result in this case was effectively to conserve subsoil moisture, and probably to increase fertility by sweetening the soil to a depth of 5 inches, but at the same time it lessened the effectiveness of the compacted sub-surface soil.

The rigid-tine scarifier is ever becoming more popular, particularly for the heavy soils, and they also do excellent work on the loams.

Western District (Dubbo Centre).

B. M. ARTHUR, H.D.A., Senior Agricultural Instructor.

DURING 1929, fallow competitions were conducted by the Pastoral, Agricultural and Horticultural Associations of Narromine (ten entries), Dubbo (seventeen entries), and Cumnock (six entries), making a total of thirty-two competitors.

After a lapse of several years Narromine re-entered the lists of associations conducting competitions, as also did Cumnock. Great interest was evinced by all competitors, many entering with no other idea than to have their fallows discussed and criticised, with the object of obtaining further information which would be likely to assist them in their future preparations.

The Season.

The rainfall recorded at the various centres was as follows:—

	Narromine.	Dubbo.	Cumnock.
1928	Points.	Points.	Points.
July	234	228	237
August	30	31	26
September ...	12	15	24
October	77	57	97
November... ...	104	92	104
December... ...	Nil.	Nil.	Nil.
1929			
January	20	26	13
February	270	501	333
March	120	151	100
Totals ...	867	1,101	934

It was not a good season for the preparation of fallows. The latter half of 1928 was extremely dry, and was not conducive to suitable workings being given to early ploughed land. Sufficient rains fell in June and July to make ploughing under suitable conditions possible during those months, but any one leaving their ploughing till later found the soil hard and dry to work. No rain of any consequence occurred from August till early November, when about 90 to 100 points were recorded. This enabled the initial working with a springtooth or harrows to be given some of the fallows, but many were not worked because the operations would have clashed with the harvesting.

December and January were practically dry, and fallows did not contain much moisture up to that period. Good rains, mainly thunderstorms, were recorded during February, and again during March, and these put a fair amount of moisture into all fallows, allowing of their being worked under

suitable conditions on more than one occasion. This was followed up by splendid soaking rains, varying from 1 to 2 inches, early in April, which thoroughly saturated prepared soils and made sowing possible under ideal conditions. It was possible to keep weeds well in control this season, which was in sharp contrast to the experiences of last year.

The Narromine Competition.

This competition was judged during mid-March. It is Narromine's first fallow competition for some years.

Fallows were not worked very often, owing to lack of rain, but averaged about three workings, excluding the ploughing. Weeds were present in all fallows, but were not many or troublesome, being mostly wild tomato and bluebell, with a few melons and wild oats.

First and second places were awarded to Messrs. Ken. and W. H. Gainsford, of Yarran Farm, who scored 135 and 134 points respectively. These two farmers have a thorough understanding of the requirements of a suitable fallow to suit their local conditions. Their soil is a medium red loam overlying a fairly open clay subsoil at from 8 to 10 inches deep, which gives a good natural drainage. It is even in texture and of alluvial origin. The land was disc ploughed in June, 4 inches deep, and springtoothed during August, November, and February. The outstanding features were an even mulch of 2 inches, which was nicely clodded, well compacted, and consequently contained adequate moisture, and was reasonably free from weeds.

The Dubbo Competition.

Seventeen entries were received in this competition. Judging was delayed by unforeseen circumstances until early in April, after two days good soaking rains, consequently all fallows scored highly for moisture content, and most of them showed the presence of weeds to a greater or lesser extent. Scoring was close, and only after giving careful consideration to details as regards the mulch and compactness was it possible to decide upon the winning fallow, which scored 140 points, whilst the seven leading competitors were all within 5 points of that total.

Ploughings took place between March and August, and the number of workings varied from one to six, with an average of three and a half.

Mr. W. Dohnt, of Bonnie Doon, Eumungerie, exhibited the winning fallow, which was on a heavy black clay loam of the self-mulching type. It was mouldboard ploughed 4 inches deep in July, and springtoothed three times as required. A nice even mulch of a uniform depth of 2 inches over a well compacted lower stratum was the result. Weeds were not prominent.

Mr. H. Harvey, of Kindalin, a prominent supporter and frequent prizewinner in various competitions, scored well to occupy second place. His fallow was on a light red sandy loam, with sand veins running through it,

which makes it extremely difficult to obtain even consolidation and depth of mulch. The land was disc ploughed in March, 4 inches deep, and worked five times with a rigid-tine scarifier and harrows.

Mr. N. Hubbard, of The Wilgas, Wongarbon, a young and progressive farmer, scored a meritorious third on a heavy chocolate clay loam. Weeds were noticeable, and the mulch was slightly too deep. It was disc ploughed in June and worked five times.

The Cumnock Competition.

This association conducted its third fallow competition with six entries. Judging took place in mid-March.

The preparation of certain fallows in this district has improved considerably during the past three years as a result of these competitions, notably those of the competitors occupying first and second places. These men now have a practical understanding of the principles underlying the preparation of a good seed-bed to suit local conditions.

Messrs. S. R. Reynolds and Bellamy, of Burrawang, scored first place with 135 points. Moisture content, mulch, and consolidation were good, but many saffron thistle seedlings were present. The land was disc ploughed 4 inches deep in August, and springtoothed in October, January, and March, each working being shallower than the previous one.

Mr. G. Coram, of Castle Hill, mouldboard ploughed his medium red loam 4 inches deep in June, harrowed in August, springtoothed in September, disced in October, harrowed in February, and springtoothed late in February. The presence of couch grass was the worst feature, and the mulch was variable and too shallow in places, with consequent loss of moisture content.

Comments.

Fallowing practices are on the increase in this portion of the western district, but many have yet to learn that early ploughing of the land does not constitute a fallow, and that there are many further steps to be taken before the ideal seed-bed is produced. A layer of well consolidated soil below a uniform depth of mulch is essential for an even germination and sustained growth to be obtained. It is also very essential that the sowing of the seed be so arranged that it goes down on to this firm bottom, provided it is sufficiently moist to ensure an early and uniform germination. The mulch should not be so deep as to necessitate sowing at too great a depth.

Sheep are very necessary to assisi the farmer in his fallow preparation. They save an untold amount of work by keeping weed growth in check, and also assist largely in the consolidation of the soil. They also help to maintain fertility and good condition in soils by leaving rich droppings on the ground whence the food was obtained.

Weeds, particularly those such as stink grass (*Eragrostis major*), saffron, star, and black thistles, Mexican poppies, melons, burrs, and wild oats, should be kept well in hand, and an early working when weeds first appear will save much time and trouble at a later date.

Many farmers waste far too much land around the headlands. Land costing £6 per acre and upwards is far too valuable to be left to grow weeds and harbour diseases. Admittedly it is not easy to approach too close to a fence when working large teams of horses abreast, but it is well worth the effort and time to take special steps to reduce these wide headlands. On the other hand, it is not advisable to go to the other extreme and sow crops right up to the fences, to the possible detriment of the fences due to stock leaning over to eat the crop.

South-western District.

G. NICHOLSON, H.D.A., Agricultural Instructor.

In this district fallow competitions were promoted by the following agricultural societies:—Ariah Park, 18 entries; Barellan, 14; Young, 9; Murrumburrah, 4; Barmedman, 5; Lake Cargelligo, 12; and Tullibigeal Agricultural Bureau, 18; total, 80 entries.

Competitions conducted by the first five societies were judged in March, and the Lake Cargelligo and Tullibigeal competitions about the middle of April, after 1 to 2 inches of rain had fallen. On this account the later judged fallows had the advantage of an additional cultivation.

Compared with the previous season the number of competitors showed a distinct falling off, particularly at Ariah Park and Barellan. The comparatively low number of entries is due not so much to lack of interest as to the long dry spell, conditions being unfavourable for the production of a high-class fallow. The early part of 1928 was very wet, and with due attention to the later cultivations conditions were such that almost any fallow could be placed in reasonably good order, irrespective of time of ploughing. This season (1928-29), however, the position was reversed, and only early ploughed fallows showed to advantage.

The Season.

The fallowing period—June, 1928, to March, 1929—was exceptionally dry, no effective rains falling on the fallows later than July. At Barellan from the beginning of August to the end of February only 3.39 inches of rain fell on the fallows, and this was spread over a period of seven months, not one fall being of sufficient magnitude to be of any material value. Consequently the fallows received a minimum of cultivation, and it was not surprising that the standard was below that of the previous year. As it was too dry to cultivate, sheep were invaluable in keeping fallows free from weed growth. A few fallows which had not been grazed with sheep were somewhat dirty despite the particularly dry season.

The following table shows the monthly rainfall recorded at each centre from June, 1928, to time of judging:—

Month.	Ariah Park.	Barellan.	Young.	Murrumburrah.	Barmedman.	Lake Cargelligo.	Tullibigeal
1928	Points.	Points.	Points.	Points.	Points.	Points.	Points.
June ...	85	65	90	161	161	148	72
July... ...	243	139	287	292	152	238	211
August ...	45	60	91	67	52	14	34
September ...	50	51	80	46	27	43	43
October ...	75	82	126	60	82	156	72
November ...	3	29	50	50	Nil	24	33
December ...	8	60	Nil	Nil	Nil	34	2
1929							
January ...	3	9	Nil	Nil	Nil	Nil	11
February ...	126	50	120	118	156	Nil	67
March ...	...	...	...	...	...	83	82
April (to 15th)	...	...	...	...	...	249	177
Total ...	6·38	5·45	8·44	7·94	6·30	9·89	8·04

Ploughing.

The initial working of the fallow should be commenced immediately sowing is completed, and not delayed for a month to six weeks. There is a tendency to delay ploughing until too late in the year, with the result that, unless the springs rains are favourable, the area cultivated is limited or is indifferently carried out. Sacrifice of a small quantity of feed is the principle argument advanced against early ploughing. On the average holding it is impossible to plough the full area in a week or so, therefore, by concentrating on the feeding off of one paddock at a time the loss of grazing is of no account, since it is compensated for in the additional grazing to be had on the fallow.

This season the advantages of early ploughing were amply demonstrated. With a few exceptions, the greater number of the fallows entered in the competition were ploughed in July or earlier. It is not unreasonable to surmise that land ploughed later in the year was not entered in the competition because it was not in a satisfactory condition. Land ploughed prior to or immediately following the July rains turned over in excellent order, whereas later worked land was indifferently ploughed and turned up in a rough, cloddy condition. Occasionally the season may be favourable to late ploughing, but the uncertainty of spring rains emphasises the necessity of early ploughing before the surface soil has dried out.

The depth of ploughing depends on the district and on the soil type. Most heavy soils require deeper working than the lighter types, as the mulch tends to become shallower after each cultivation. Deep ploughing, except under special circumstances, is not to be recommended. However, the tendency is to plough too shallow. Three to four and a half inches deep, depending on the type of soil, is satisfactory, but some fallows supposed to

have been ploughed to this depth on examination were found to have been ploughed only 2 to $2\frac{1}{2}$ inches deep. It is doubtful if very shallow cultivation can be carried on year after year without ultimately affecting the yield. Even and regular ploughing is equally as important as the later cultivations.

Early ploughed and early cultivated fallows were able to retain the moisture they absorbed during the previous autumn, even during the hot dry summer months. Later ploughed fallows and fallows which had been worked very shallow did not show the same moisture content.

Cultivation of the Fallow.

Because of the very dry summer, fallows received a minimum of cultivation. Generally they were lacking as regards compact and level seed-beds. This defect was not nearly so marked in fallows that had been ploughed early, cultivated deeply in the springtime, and heavily stocked with sheep. In some quarters an erroneous impression exists that a high scoring fallow must be one that has received the greatest amount of cultivation. This is not necessarily the case. Provided the workings have been done efficiently, and with a definite object in view, the fallow will benefit from the additional cultivations. No advantage is to be gained by working the land when dry; it throws the mulch out of condition and may favour the spread of wheat diseases. Early, thorough, and regular ploughings, in combination with thorough cultivation, carried out expeditiously and with the best type of implement, are the most important factors which go to produce the ideal fallow.

The importance of a deep cultivation early in the spring, before the soil has commenced to dry out, cannot be too strongly advocated. This working should be to the full ploughing depth, the object in view being to comb the larger clods to the surface and allow the fine soil particles to sift to the bottom. The springtooth cultivator fitted with narrow points is to be preferred to the scarifier, since it has a better combing effect and gets to the full ploughing depth. On the other hand, the scarifier is too rigid, and tends to press many of the clods into the seed-bed rather than to work them towards the surface. Judging by the number of buried clods found in the seed-bed of some of the fallows, it is evident that the deep spring working had been neglected. Furthermore, there is a tendency to delay the deep cultivation until too late in the year.

The outstanding fallows were those which had been cultivated with the scarifier after harvest. When correctly adjusted it is the only implement that will give an even depth of mulch and a level, firmly compacted seed-bed. Each year the scarifier is becoming increasingly popular. Where one implement only is available the rigid-tine combine is to be preferred to the spring-tine. This season many fallows cultivated with the springtooth had an indefinite division between the mulch and the seed-bed. Consequently, since the April rains both the mulch and the seed-bed have had an indefinite

moisture content, thus making sowing a doubtful practice at the present time. Scarified fallows have dried out well in the mulch, and dry sowing can be gone on with, there being little danger of the seed going mouldy.

Depth of Mulch.

The importance of cultivating the fallow has received considerable publicity of late years. The general recommendation as regards depth is 2 to 3 inches. There is a tendency to adopt a shallower mulch of from 1 to 1½ inches. This, while very desirable near seeding time, does not provide an adequate cover during the summer months. A number of examples have come under notice demonstrating that the deeper mulch is the more effective.

Throughout the south-west there is to be found a great variety of soils, ranging from deep light mallee soils to shallow heavy clays and self-mulching soils. In the Young and Murrumburrah districts the soils are more uniform; elsewhere they vary considerably. The two extremes in soil types are in evidence in the Barellan, Tullibigeal, and Lake Cargelligo districts. Under average seasonal conditions the heavier types of soil have a greater potentiality than the lighter soils. Comparing light with heavy soils is the same as attempting to compare a soft-flour wheat with a strong-flour wheat. Although it is impracticable to make a special class for each soil type, it would be preferable to have the fallow competitions divided into two classes, namely:—

Class I.—Medium heavy to heavy soils, having a good clay subsoil near the surface. Most country carrying Belar, Bull Oak, Boree, Yarran, Grey box, and Bull mallee would be included in this class.

Class II.—Medium to sandy loams, having a good depth of soil and a light subsoil. This class would include principally mallee, pine forest, and probably some classes of pine and box country.

POINTS Awarded Winners of Local Competitions.

Society.	Name.	Moisture.	Mulch.	Cleanliness.	Compactness.	Condition.	Total.
	Maximum Points ...	35	35	35	35	10	150
Ariah Park	J. Hawkins	28	27	34½	30	7	126½
Barellan	G. Gow (No. 2 entry) ...	29	29	34	27	8	127
Young	H. C. Thackeray (No. 2 entry)	27	28	34	26	8	123
Murrumburrah... ...	G. H. Coddington ...	29	31	31	30	9	130
Barmedman	McGuire & Fehon (No. 3 entry)	29	30	35	28	9	131
Lake Cargelligo ...	J. Mann	31	30	32	28	8	129
Tullibigeal	G. A. Wallace	28	29	30	32	8	127

Particulars of Winning Fallows.

Ariah Park.—The soil varies from a medium light loam to a brown sandy loam with a good clay subsoil. It was summer fallowed in January with the disc cultivator, mouldboard ploughed in June, springtoothed deep in October, and scarified in March.

Barellan.—Heavy, friable brown clay of a self-mulching character. The paddock has been under fallow practically since 1926. It was sown in 1927, but owing to the drought was fed off. As a result of the heavy autumn rains it was flooded in March, 1927. Scarified 3½ inches deep in June and cross-scarified 3 inches deep early in August. Although the fallow received no further cultivation it was in first-class order, the summer rains being insufficient to even crust the mulch. Throughout the fallowing period it had been heavily and systematically stocked with sheep.

Young.—Medium heavy brown loam with a good clay subsoil. Mouldboard ploughed 3½ inches deep in July and August, harrowed in September, scarified in October and again in November, and harrowed in February. Fallow well stocked with sheep.

Murrumburrah.—Light, friable, to red, medium granitic loam. It was mouldboard ploughed 4½ inches deep in August, harrowed in August, springtoothed deep in November, and springtoothed in February.

Barmedman.—Brown to black semi self-mulching soil with a stiff clay subsoil at 3½ inches. It was mouldboard ploughed 3 inches deep in June and July, springtoothed deep in October, and springtoothed in February.

Lake Cargelligo.—Red, light to medium, deep loam. Disced 3½ inches in July, springtoothed deep in mid-September, harrowed in October, springtoothed in January, harrowed in March, and springtoothed in April.

Tullibigeal.—Medium heavy brown loam. Scarified 3½ inches deep in July with 8-inch points, scarified in October 3 inches, and scarified again in March 2 inches deep. The fallow was kept well stocked with sheep.

West Wyalong Competition.

E. S. CLAYTON, H.D.A., Senior Experimentalist.

ELEVEN fallows in all were inspected, and, considering the extremely droughty nature of the previous nine months, all the fallows were in very fair condition.

This season the distribution of the rainfall has been a deciding factor in the competition. On the western side of the district the rainfall was very scanty, and it was impossible, therefore, to give the fallows a sufficient number of cultivations to bring them into first-class condition. On the other hand, it must be observed that in almost every case the competitors took full advantage of any rains that fell to work their land, and it was remarkable how well some of the leading fallows were prepared.

The rainfall was scanty and unevenly distributed over the district, rendering the judging very difficult.

RAINFALL.

Month.	Stewart Marshman.	D. Davies.	J. Coelli.	F. G. Hebblewhite.	D. Bolte.	H. McFadyen.	D. and J. Gagie.
1928	Points.	Points.	Points.	Points.	Points.	Points.	Points.
June ...	...	...	...	151	146	...	...
July ...	...	...	266	148	149	60	...
August ...	42	40	47	54	57	40	57
September ...	27	18	20	21	15	14	43
October ...	40	54	64	87	48	45	75
November ...	11	28	32	12	0	20	19
December ...	13	25	0	29	0	15	5
1929							
January ...	0	0	39	0	0	0	0
February ...	125	75	143	115	45	83	101
March ...	31	30	34	34	26	26	27
Total ...	289	270	645	651	486	303	327

The Leading Fallows.

Mr. F. G. Hebblewhite gained first place with a well-prepared fallow on a heavy brown, self-mulching clay loam. It had been scarified early in June to a depth of 2 inches, then ploughed 3 inches deep with a mouldboard plough in August, harrowed in October, harrowed again in February, springtoothed in February, and harrowed in March. The surface mulch was in exceptionally good condition, the consolidation was remarkable considering the scanty rainfall, and the fallow was quite free from weeds. Mr. Hebblewhite is to be congratulated on the neatness and thoroughness of his work. The only weakness in the fallow was the fact that the moisture was at a rather low level; it had not risen to the top of the consolidation as in some entries, but nevertheless it was quite plentiful in the subsoil.

Mr. A. Wenning's fallow was placed second. It was on heavy, brown, self-mulching clay loam with a very heavy pug subsoil. The land was ploughed with a mouldboard plough in July to a depth of 3 inches, then springtoothed 3 inches deep in August, springtoothed in January to a depth of 2 inches, and harrowed in February. This also was a very good fallow. Mr. Wenning demonstrated that he has a sound practical knowledge of these self-mulching soils, and worked his fallow to the best advantage.

Mr. Marshman's fallow was on medium brown to red self-mulching loam with a heavy subsoil. It had been ploughed with a mouldboard plough 3½ inches deep in July, springtoothed deeply in February and shallow in March. This was a good fallow, very clean, but lacking in consolidation.

General Comments.

On all the fallows sheep had been used to the fullest possible extent; they greatly assisted in keeping the surface clean and also in compacting the sub-surface soil. The fallows on the lighter types of soil were somewhat lacking in consolidation, but in a few cases were exceptionally well supplied with moisture, which sometimes came to the top of the consolidated soil.

One very pleasing feature of the competition was that the fallows having been well prepared were in a condition to allow of full advantage being taken of the autumn rains prior to sowing.

AWARDS in the West Wyalong Fallowing Competition.

Competitor.	Moisture.	Mulch.	Cleanliness.	Compactness.	Condition of headlands and finishes.	Total.
F. G. Hebblewhite, Fairfield, Wyalong ...	25	34	35	33	10	137
A. Wenning, Carnarvon, Wyalong	29	34	32	32	9	136
Stewart Marshman, Binehurst, Wyalong ...	33	31	35	29	7	135
D. Davies, Llantarnam, West Wyalong ...	28	30	34	29	9	130
J. Coelli, Loorana, West Wyalong	33	31	29	29	7	129
R. W. Davies, Llantarnam, West Wyalong ...	27	28	34	27	9	125
D. & J. Gagie, Spy Hill, West Wyalong ...	28	30	33	25	9	125
H. McFadyen, Lochbuie, West Wyalong ...	27	30	31	25	8	121
D. Bolte, Lincluden, West Wyalong... ...	25	30	30	26	9	120
J. T. Davies, Llantarnam, West Wyalong ...	25	25	34	25	9	118
R. M. Gelling, Cooinoo, Alleena	20	20	28	23	8	99

North-western District.

J. A. O'REILLY, H.D.A., Agricultural Instructor.

THE Pastoral and Agricultural Associations at Gunnedah and Narrabri have fallen into line with most of the other societies in the wheat belt of the State, and have conducted fallow competitions in recent years. This is an important phase of the activities of these associations, as it serves to demonstrate more clearly to the farmer the operations necessary to bring about the most desirable condition of the seed-bed in which to sow the wheat. Owing to the nature of the season during the nine months ending May, the number of entries was small, but the standard was very high.

The rainfall from July, 1928, till April, 1929, at Narrabri and Gunnedah was as follows:—

	Narrabri.	Gunnedah.
1928	Points.	Points.
July	241	250
August	0	0
September...	7	5
October	75	97
November	122	156
December	92	69
1929		
January	87	109
February	511	533
March	121	56
April	688	234
Total points	1,944	1,509

The season continued dry from July onwards, and the only serviceable falls were those which were recorded in February and April. Owing to the prevailing unfavourable conditions the initial working on stubble land was

delayed till after the rains in February, and these fallows lacked uniformity in depth of mulch and compactness of the sub-surface soil. The winter fallows in the Gunnedah competition were good from the point of view of compactness and depth of mulch, due to the longer period of fallow, combined with more frequent workings and the assistance of sheep. Weed growth on the fallows was almost negligible.

The Leading Fallows in the Narrabri Competition.

N. Barrett, Yera, Edgeroi.—The soil consisted of a medium red to dark chocolate loam, which had been cropped in 1928. The initial working was carried out with the rigid-tine scarifier in December and January. The fallow was subsequently worked with harrows in February and March, and springtoothed and harrowed in April. The moisture in the fallow was even and abundant. The mulch was uniform in depth and condition, overlying a nicely compacted seed-bed.

R. J. McWilliams, Matoppo, Turrawan.—The soil consisted of a medium red to sandy loam, previously timbered with pine and box. The land was cropped last year, and after burning the straw it was ploughed with a sundercut to a depth of from 3 to 4 inches in January, being subsequently worked with the springtooth cultivator in February and April. The land was ploughed dry, and some difficulty was experienced in maintaining a suitable condition in the mulch, which was somewhat on the fine side. The consolidation of the sub-surface soil was good, and the moisture was in evidence directly under the mulch. From the point of view of cleanliness the fallow showed evidence of careful handling.

Mr. McWilliams's second entry was a free-working chocolate loam, which had also been cropped last year. Moisture content was good, and the fallow was particularly free from weed growth. The mulch was somewhat on the deep side, and the consolidation was not quite all that could be desired. More satisfactory results can be obtained on this class of country by working with the rigid-tine scarifier and harrows. The workings should be given as often as practicable and should be shallow. The nature of this particular class of country is such that it is somewhat difficult to bring about that necessary consolidation of the seed-bed.

S. Carberry, Cadarga, Culgoora.—The soil consisted of a free-working greyish to black loam, previously timbered with Belar. It had been cropped the previous year, and ploughed with the disc in November, 1928, springtoothed in February, 1929, and harrowed in March. The moisture in this fallow was good and the consolidation was excellent. The mulch had run together after the rains in the early part of April, and the condition of the fallow would have been considerably improved by a working prior to judging. This country has self-mulching tendencies, and an excellent seed-bed can be obtained by the liberal use of the rigid-tine scarifier and harrows.

A. Getts, Glenville, Narrabri.—The soil consisted of a medium to sandy, reddish loam, having a tendency to run together after rain. The mulch was

deeper than is desirable on, say, a chocolate loam, but on this particular class of country, which is inclined to set down after rain, it is desirable to maintain a slightly deeper mulch. The land was cropped last year and disc ploughed in December, 1928. The fallow was subsequently worked with the springtooth cultivator in March and April.

The Leading Fallows in the Gunnedah Competition.

Gregory and Son, The Homestead, Mary's Mount.—The soil consisted of a red to chocolate loam, which had been cropped with wheat in 1927. The initial ploughing was carried out with the disc and mouldboard in August, 1928. The fallow was then worked to the depth of the ploughing in December, harrowed in January, springtoothed in February, and harrowed in March. The fallow then received two workings with the rigid-tine combine—one in March and the other in April. This was a very good fallow, and showed evidence of careful and intelligent handling. While the moisture was not as abundant as in some of the fallows at Narrabri, it was well up to the top of the consolidated sub-surface soil, immediately beneath a uniform depth of mulch. This uniform condition of the mulch was the result of the two final workings with the rigid-tine implement.

J. Cavanagh, Roanoak, Curlewis.—The soil consisted of a chocolate to red gravelly loam. Wheat was harvested in 1927, and the land ploughed with the one-way disc in July, 1928, harrowed in August, rigid-tine scarified in October, rigid-tined again in February, and harrowed, rigid-tined, and harrowed in March and again in April. The condition of this fallow indicates clearly that better fallows will result from the use of the rigid-tine scarifier. The consolidation of the seed-bed was excellent, and in view of the light rainfall on this particular fallow (643 points) the moisture content was good and well up to the surface of the consolidation, but showed slight variation in places. Weed growth on the fallow was negligible.

F. Shaw, Biwondah, Emerald Hill.—The soil consisted of a red loam, fairly light in texture. Wheat was harvested in 1927, and the land disc ploughed in August, 1928, springtoothed in December and February, harrowed and springtoothed in March, and followed by a harrowing in April. The moisture content and mulch were not altogether uniform, the mulch being a little too shallow in places. The consolidation of the seed-bed was excellent, being free from large air spaces and loose clods.

General Comment.

On reviewing the competition, it is evident that the use of the rigid-tine scarifier for initial and subsequent working will result in a much better type of fallow being prepared. This implement, together with the assistance of sheep on the fallow, will bring about a better consolidation of the seed-bed, which is one of the main contributing factors in the production of better wheat crops.

Riverina District.

G. C. BARTLETT, H.D.A., Agricultural Instructor.

DURING the period 1928-29, fallow competitions were promoted by the Farmers and Settlers' Associations of Yerong Creek and Oaklands, the P.A. and H. Associations of Albury and Corowa, and Munyabla branch of the Agricultural Bureau.

It was pleasing to note that three new competitions were commenced this year, namely, those of Albury, Munyabla, and Yerong Creek. Previously Corowa had been the only centre to conduct a fallow competition in the eastern Riverina south of The Rock. It is also noteworthy that these three new centres are all in the eastern Riverina, and in this district there was a fairly common belief among farmers that the orthodox type of fallow did not suit these particular parts, but that rougher conditions produced the best results. Where this belief was most prevalent, upon examining the fallows it was found that the clods as turned under by the plough were still underneath and the soil was becoming fine on the surface. Under these conditions it can be readily realised that the more the surface was worked the finer it became and the more readily it would set, while the seed-bed would be very loose and open and full of unbroken clods. Two factors contributed mostly towards this. In the first place the ploughing was rather late, and almost without exception the fallows lacked the deep working so necessary before harvest. Still, it was found that the few farmers who have been producing the most successful crops in recent years have been fallowing according to the best known methods. This should quickly demonstrate what methods are best suited to the district, and the progress of agriculture in these parts should be very interesting.

It had also been stated that the winters experienced in the eastern Riverina were too wet to permit of ploughing before August, yet the most successful fallows in the competition were the early ploughed. It was also found quite practicable to summer fallow, say, 100 acres, and then another 100 acres immediately after seeding.

The Season.

The season was rather dry throughout. A very dry winter was experienced, but was broken by a good fall in October, which gave farmers the opportunity wanted to work their fallows before harvest, and this factor was reflected in the condition of the seed-bed right up till sowing time. The summer was dry except for one good fall about the middle of February. Fallowing conditions on the whole were rather difficult, but these two breaks were most opportune, and in the several instances in which farmers took advantage of them almost ideal fallows resulted.

The season broke most favourably at the end of March, and gave farmers an opportunity to work their fallows, while the nature of the fall produced the best strike of wild oats and weeds seen for some time.

The rainfall at the various centres was as follows:-

RAINFALL at Various Centres.

Month.	Henty.	Oaklands.	Corowa.	Albury.
1928.	Points.	Points.	Points.	Points.
July	165	102	200	271
August	56	44	41	82
September	99	58	99	110
October	267	152	274	351
November	27	...	4	17
December	41	17	...	15
1929.				
January	21	31	76	57
February...	167	171	236	128
March	145	126	200	144
April (to 9th)	138	289	250	189

It was often said that the season was too dry to work the fallows, yet in every district the leading farmers had found opportunity to work their fallows four and five times. The most successful fallows in every district were worked twice before harvest, being mostly a harrowing after ploughing and a good springtoothing or scarifying. The main factor was the early ploughing, and in every case where this had been carried out good seed-beds were found, while only under exceptional circumstances—where there was a very heavy fall of rain in February—were good seed-beds found in cases where the working had been left till after harvest.

Working the Fallows.

Most rapid advancement has been made the last two years in the method of fallowing. Many of the fallows this last season were almost perfect, as the high awards show, notwithstanding the rather adverse conditions. Most noteworthy among the factors responsible for this rapid change are earlier and deeper ploughings. Very few farmers now plough under 4 inches deep, while several are ploughing 5 inches. More frequent, earlier, and deeper working before harvest, the use of wider points, shallower workings after harvest, and the working of smaller areas are points that should be given consideration to. Farmers are advised to concentrate on smaller areas in place of the considerably large areas which were to be seen in many years during this last season.

An implement that is playing a prominent part in producing excellent fallows is the rigid-tine duckfoot scarifier. It is producing a firm level seed-bed without the "waves" that the combine usually makes. It maintains an even depth of mulch, and throws the mulch into small even ridges that hold. Farmers are not now relying on the lumps to prevent their fallows running together, but are working them down with a view to the making of a good seed-bed and producing that ridgy surface which holds out the longest in the most satisfactory condition.

On the heavier clay loams the heavy iron smoodger is doing excellent work in breaking down the sod after ploughing. This should be done in the spring before the soil dries, and should be followed by the springtooth cultivator. The winning block of fallow in the Corowa competition was treated in this manner. The scarifier is the best implement with which to work the fallows after harvest. There are considerable areas in the Corowa, Oaklands, and Yerong Creek districts which should receive this treatment.

The Munyabla Competition.

This was the first fallow competition held in the Henty district, and was conducted by the local branch of the Agricultural Bureau. There were fifteen entries, all within a 10-miles radius.

The soils are mostly red and brown loams. Some of the red loams run to gravelly rises and some of the brown loams run to clay loam flats. All were mouldboard ploughed, three were ploughed 5 inches deep, four were ploughed only 3 inches deep, and eight were ploughed 4 to 4½ inches deep. All were worked before harvest, but two only were harrowed. Eight were worked twice before harvest, but some were only worked shallow. Eleven were ploughed in June or July, and four in August.

The number of workings ranged from one to four, and averaged 2.7. The average number of points awarded was 137, but the first six fallows were particularly good, all scoring over 140, while only 3½ points separated first place from sixth. The points awarded ranged from 123½ to 145.

The winner, Mr. W. Semmler, with a block of dark loam of fair depth, scored 145 points. This was previously under oats, being mouldboard ploughed early in July to 4½ inches, harrowed in August, scarified deep at the end of September, and scarified shallow with the wide 8-inch points in February.

Mr. C. Doig was a close second, scoring 144½ points with a block of red brown loam which had also previously been under oats. This fallow was mouldboard ploughed 4½ inches deep early in July, harrowed in August, springtoothed deep at the end of August, springtoothed shallow with wide points in February, and harrowed in March.

The Yerong Creek Competition.

Conducted by the local Farmers and Settlers' Association, this competition was also the first carried out in the district. There were sixteen entries, comprising twenty-nine blocks. This competition embraced the whole of the fallow on the farm. Each block was judged separately, and the points awarded and particulars concerning each were kept apart from the average. This society is very keen on its work, and displayed very creditable energy and enthusiasm, and was anxious to conduct a competition that would yield the most valuable information likely to be of help in increasing the average acre yield. It was advised towards this end to limit entries to specified blocks and paddocks on which the work could be followed up and the results of any particular method watched.

In this district most of the ploughing is done rather late, and is rather too shallow. Most of the fallows lacked the deep working before harvest (being only harrowed or springtoothed shallow), and very few good seed-beds were seen. This is an excellent district, and if some considerable changes in fallowing methods are brought about by the competition very rapid advancement in yields should shortly be made.

Sixteen blocks were ploughed during August or later, and thirteen during June and July. All were ploughed with the mouldboard, but eighteen were ploughed on the shallow side. The number of workings ranged from one to three, and averaged 2.5. The average number of points scored was 122, and only six blocks received over 130. The points awarded ranged from 110 to 136.

The soils are mostly good red or brown loams, some running to gravelly rises, while towards Tootool there are heavy clay loams.

The individual block that received the highest award (141 points) was worked by Mr. T. McRorie. It is red loam, and was mouldboard ploughed 4½ inches deep in early August, harrowed in October, springtoothed deeply in November and shallow in March. The mulch was good, but the consolidation was not all that could be desired.

The Oaklands Competition.

Conducted by the Farmers and Settlers' Association for the fifth year, this competition attracted thirty entries, and the fallows were excellent. No less than fifteen competitors scored 140 points and over. The average number of points awarded was 135, ranging from 103 to 145. Very rapid advancement has been made in this district, due in a large measure to the keen interest of the farmers and the organising body.

Twenty-five of the fallows were ploughed in June or July, only five being ploughed in August or later. Twelve were disc ploughed, and eighteen mouldboard ploughed. This is one of the few districts met with where the disc plough is still used to any extent. It has its uses under certain conditions in this district.

The number of workings ranged from one to six, and averaged 3.3. Only five were worked once or twice, the remaining twenty-five being worked at least three times. The leading fallows were all worked four to five and six times. The scarifier is playing a prominent part in this district.

The soils are varied and many mixed. They consist of red loams, sandy loams, clay loams, and mixed clay loams of a blue, brown, and black nature.

The winner, Mr. J. L. Harvie, produced an excellent fallow on a soil that was difficult to handle, and was awarded 145 points. It was a light sandy loam, having previously been under oats. It was disc ploughed 4 inches deep early in July, scarified early in November and again in March, and

harrowed twice in April. It was a difficult soil to consolidate, but the seed-bed was excellent. The mulch was a little too fine, due to the harrowing in April. It would have been a perfect fallow had the scarifier been used instead.

Mr. W. Young, of Daysdale, produced the next best fallow, scoring 144 points on a strong red clay loam. This was mouldboard ploughed 5 inches deep early in July, springtoothed in September and again in October, February, and April.

The Corowa Competition.

There were only sixteen entries this year, but the fallows were excellent. The points ranged from 120 to 145½, and averaged 140, the highest average of any of the districts—thirteen of the sixteen were awarded 140 points and over. All were mouldboard ploughed, ten being ploughed in June or July and six in August or later. All except two were worked twice before harvest, and all except two were worked four or five times, or, on the average, four times.

The soils are of a very mixed nature, being red and brown loams, sandy loams, clay loams, and mixed clay loams.

Mr. J. Kingston, of Coreen, produced the best fallow on a heavy brown clay loam. It was mouldboard ploughed early (in June) and deeply (5 inches). It was then smoodged and springtoothed in September, and springtoothed twice in February and April. The last crop was wheat. The fallow was beautifully finished, with a seed-bed almost to the fence. The strikes and finishes were level, with almost the same seed-bed as the rest. This entry was awarded 145½ points.

Messrs. W. and O. Field, share-farmers on Collendina Station, presented a fallow that was awarded 144½ points. It was also heavy brown loam, and was mouldboard ploughed 4½ inches deep early in July, harrowed in September, springtoothed, rolled, and springtoothed in October, and scarified in February and April. It was equal to the winning fallow except that the headland and finishes were not quite so well finished.

The Albury Competition.

Conducted by the local Pastoral, Agricultural, and Horticultural Society, this was the first competition carried out in the district, but the leading farmers demonstrated that they could produce fallows second to none.

There were sixteen entries. The points awarded ranged from 127 to 146, averaging 139.5 (only half a point below the district with the highest average), while eight of the sixteen competitors were awarded 140 or over.

Despite the belief in certain quarters that modern fallowing methods do not suit this district, it is noteworthy that the leading fallows were all ploughed fairly deeply in June or July, worked twice before harvest (once deeply), and worked four and five times altogether. These fallows were all submitted by men who are the most successful crop producers.

The best fallow of the 106 blocks judged in the Riverina was seen in this district. It was submitted to Mr. C. W. Moll, of Gerogery, who has had a nine-bag average for the last twelve years. This was a red loam, which was mouldboard ploughed 4½ to 5 inches in early July, and harrowed in August, scarified deeply in September, and again with the wide 8-inch points in January and early April. It was beautifully finished, the workings and depth of seed-bed and mulch were very even. The plot was awarded 146 points.

The next best entries were two submitted by Messrs. G. and H. Nation, of Jindera. The soil is a heavy brown loam, which was mouldboard ploughed 4½ to 5 inches deep in June, harrowed in August, scarified deeply in September, January, February, and April.

These fallows were very little inferior to the winning entry, and were awarded 145 points each. Four years ago Mr. Nation was satisfied with a 14-bushel average, but with modern methods he averaged 27 bushels over the whole farm last year, and this year submitted the second best fallow in the Riverina.

Mr. Moll's second entry was awarded 145 points, with Mr. A. C. Severin, of Brocklesby, 1 point behind.

Eleven entries were mouldboard ploughed in June or July, and five in August or later. All except three were worked twice before harvest, the average number of workings being 3.5. Nine of the fallows, including the first four. were worked with the scarifier.

The soils were mostly red and brown loams, and embraced a wide scope of country, including Gerogery, Walla Walla, Walbundrie, Brocklesby, Moorwatha, and Jindera.

Comment.

The winning fallows in the Oaklands, Corowa, and Albury districts were nearly perfect and hard to fault. It is getting more difficult each year to place the first three or four fallows.

A notable feature in several districts this year was the number of competitors who scored low last year, but who this season were well up among the leaders.

Rain made judging difficult, and this necessitated the giving of full points to all competitors for moisture in several cases, but it did not materially interfere with the other aspects of the judging, principally as regards the condition of the seed-bed and the mulch.

There is a belief, now fast disappearing, that the one standard of judging is fixed for all soils and climates, but I would like to point out to farmers that if the judging is to be done efficiently the judge must know the country and climate, and judge each paddock according to the class of soil and the kind of fallow best suited to the climatic conditions.

Lamb-raising Trials, 1928.

EXPERIMENTS AT BATHURST AND COWRA EXPERIMENT FARMS.

J. M. COLEMAN, Senior Sheep and Wool Instructor.

Trials at Bathurst Experiment Farm.

FOR many years crossbred ewes have been used for the lamb-raising trials at Bathurst farm, but last year a flock of large-framed merino ewes took their place. These were western-bred maiden ewes rising four-tooth, and were an ideal line. The rams used in the trial were the Dorset Horn, Ryeland, and the Border Leicester.

As is the usual practice at Bathurst, the flocks were yarded every night, and grazed throughout the year on stubble, fallows, and occasionally on fodder crops. Subsequent to June the conditions were very dry, and the effect of the dry feed was very evident in the lambs.

Mating was commenced on 10th February, and the rams were left in for six weeks, being taken out on 23rd March. The first lamb was born on 12th July, and the lambing concluded on 24th August.

Results of the mating are shown in the following table:—

Breed of Ram.	Ewes Mated.	Rams Used.	Ewes Died during Lambing.	Ewes Missed.	Lambs Born.	Twins.	Ewes Assisted	Lambs Died.	Lambs Marked.	
									No.	Percentage.
Dorset Horn ...	59	2	...	5	56	2	5	5	51	86·4
Ryeland ...	59	2	4	6	53	4	11	14	39	66
Border Leicester	59	2	...	19	43	3	1	6	37	62·7

It will be noticed that eleven of the fifty-nine ewes mated to Ryeland rams needed assistance at lambing, and also that four ewes and fourteen lambs died as a result of the lambing. Losses such as these would indicate that it is unprofitable to mate the Ryeland direct on merino ewes, the return per ewe this season being very low as compared with other crosses. These losses are, no doubt, due to the exceptional width across the poll of the Ryeland.

The first draft of lambs was marketed on 16th December, 1928, and the second on 21st January, 1929. The lambs were by no means attractive, being uneven and lacking in conformity, and, in some instances, seedy. These remarks apply particularly to the second draft marketed.

Six lambs of each cross of the first draft were taken straight to the abattoirs, and the average dressed weight was found to be as follows:—Dorset Horn cross 34.5 lb., Ryeland cross 29.5 lb., Border Leicester cross 29.9 lb.

The average prices and returns are given in the following table, which also includes the return per ewe mated (exclusive of wool return):—

Breed of Ram.	Ewes Mated.	Lambs Sold.	Average Price per Lamb.	Lambs retained on Farm (valued at 10s.).	Total Return from Lambs.	Ewes Died during Lambing. (£1 ea.).	Net Value of Lambs.	Average Return per Ewe Mated.
			s. d.		£ s. d.	£	£ s. d.	s. d.
Dorset Horn ...	59	50	18 5	1	46 10 10	...	46 10 10	15 11
Ryeland ...	59	33	17 8	6	32 3 3	4	28 3 3	9 7
Border Leicester	59	35	17 7	2	31 14 2	...	31 14 2	10 9

The outstanding feature of the trial was the unsatisfactory showing of the Ryeland-Merino cross. The carcases of this cross seen at the abattoirs were very uneven and poor in quality, especially when compared with second-cross lambs. This is interesting when we know that, when mated with the crossbred ewe, the Ryeland ram gives particularly good results. The trial will be repeated, as some of the trouble may have arisen from one or other of the rams used.

The Border Leicester cross gave a low return per ewe, principally because of the poor percentage of lambs born.

Another noteworthy feature of this trial was the small number of twins born compared with previous years, when crossbred ewes were in use.

The number of twins last year was nine from 177 ewes, whereas the 198 crossbred ewes mated the previous year dropped fifty-nine twins.

Trials at Cowra Experiment Farm.

The Lincoln-Merino and Border Leicester-Merino crossbred ewes were again used for the lamb-raising trials at Cowra farm. The rams used were Ryelands and the Dorset Horns.

The ewes had excellent feed throughout the year, being on natural pasture until the lambing commenced, and then any amount of fodder crops, such as wheat, oats, rape and lucerne were available. Consequently, the season, though dry towards the end of the year, did not affect the condition of the ewes and lambs.

During the mating period some cool weather was experienced, which doubtless was responsible for the excellent lambing percentages from the Ryeland rams, as this breed will not work during the very hot weather. On 5th January the rams were joined, and were not taken out until 21st March —a period of eleven weeks. Each group was yarded every alternate night for two weeks during the mating period.

The mating was as follows:—

Mating Period.	Breed of Ram.	Rams used. No.	Rams used. Percentage.	Breed of Ewe.	Number.	Total.
5th January to 21st March.	Dorset Horn	5	2½	Lincoln x Merino ...	90	200
				Border Leicester x Merino.	110	
	Ryeland ...	4	2	Lincoln x Merino ...	89	200
				Border Leicester x Merino.	111	

Lambing commenced on 15th June in the Dorset Horn group, and on the 18th June with the Ryeland.

Details of the lambing are shown in the following table:—

Breed of Ram.	Ewes Died Prior to Lambing.	Ewes Died during Lambing.	Lambs Born.	Born Dead or Died Prior to Marking.	Twins.	Lambs Marked. No.	Lambs Marked. Percentage.
Dorset Horn... ...	...	3	202	7	23	195	97·5
Ryeland	...	1	207	11	48	196	98·0

A most remarkable feature of the above mating is the number of twins in the Ryeland group—24 per cent. of the ewes mated dropped twin lambs.

The next table gives the net return per ewe mated (excluding wool returns):—

Breed.	Ewes Mated.	Lambs Sold.	Average Price per Lamb.	Total Return from Lambs.	Lambs retained on Farm (10s each).	Total Return from Lambs.	Ewes Died During Lambing (£1 ea.).	Net Return from Ewes.	Average Return per Ewe Mated.
			s. d.	£ s. d.		£ s. d.	£	£ s. d.	s. d.
Dorset Horn.	200	172	23 4½	201 0 7	23	212 10 7	3	209 10 7	20 11¼
Ryeland	200	149	21 4	159 1 11	47	182 11 11	1	181 11 11	18 2

Control of Flag Smut of Wheat by Resistant Varieties.

J. T. PRIDHAM, H.D.A., R. E. P. DWYER, B.Sc.Agr., and R. HURST.

FLAG SMUT is one of the most serious diseases of wheat in Australia, and any means of preventing loss from it is well worth consideration.

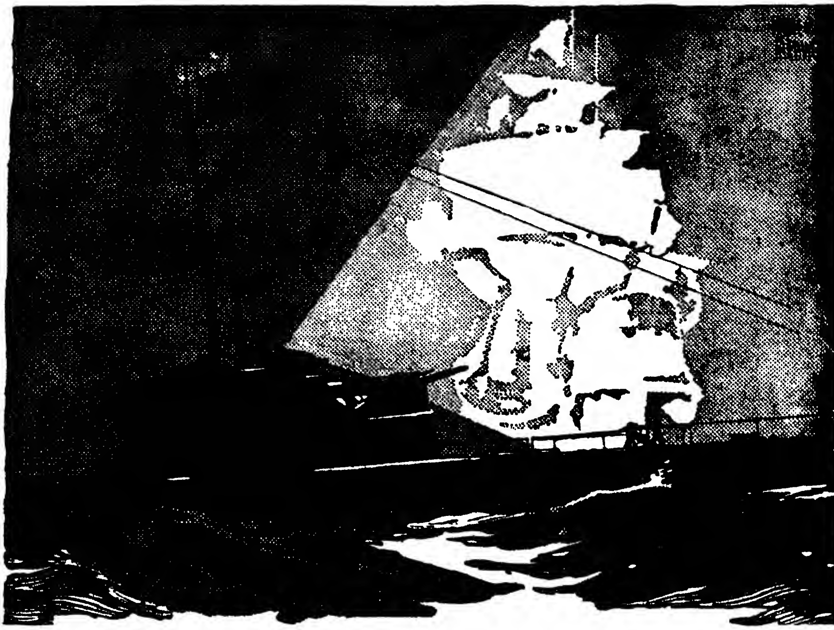
It was recognised a few years ago that certain wheats appeared to be more resistant than others to this disease, and as there was a possibility of this inherent resistance being transmitted in crossing, it became the task of the plant breeder to investigate the comparative resistance or susceptibility of different varieties with this object. Practically no information with respect to Australian varieties in this regard was available until recent years, but W. L. Waterhouse, M.C., B.Sc.Agr., of Sydney University, brought back from America in 1921 two varieties, Galgalos and Red Rock, which were immune or highly resistant to flag smut in that country.

These American varieties were, of course, far too late in maturity to be of direct value as varieties suited to our wheat belt, but they were at once utilised in cross-breeding with out best standard varieties which were known to be rather susceptible. Mr. Waterhouse crossed Canberra with Red Rock in 1921, and some strains are now practically fixed in type. None of these strains is wholly immune to flag smut like the original parent Red Rock, but a few are highly resistant. Their agronomic qualities have not yet been determined. The Department of Agriculture used the other immune American variety, Galgalos, in crossing with Federation and Bena. The families from this cross are not yet fixed in type, but some are very highly resistant to flag smut and appear to be of good agronomic type.

Comparative Resistance of Local Varieties.

Meantime it was considered desirable that something should be known of the standard local wheat varieties in this regard, and investigations were therefore commenced in 1923 to test the comparative resistance of these varieties. Most of the best standard varieties were unfortunately found to be susceptible, and in 1927 the work of testing varieties was considerably extended to include many other introduced and locally-bred varieties which had not, up till then, got into general cultivation. As the result of this work the Department is now in possession of much valuable data as to what varieties are likely to constitute the best parents in breeding for resistance to this disease.

The plan of conducting the work was to spread heavily flag-smutted straw on the field and to heavily dust the seed with flag smut spores, and sow it early under conditions as far as possible favourable to the development of the disease. Three sowings were made in short rows at intervals of about a week and percentage counts of infection taken. It was considered that these percentage counts alone did not truly express the comparative resistance or susceptibility of the variety to flag smut, as some



wheats with a comparatively high percentage of disease were not as appreciably affected in yield as some with a lower percentage of plants actually attacked by the disease. It was, therefore, deemed advisable to give each variety a scale number between 0 and 5, which would be more expressive of its comparative resistance as denoted by the toll of the potential yield taken by the disease, and the varieties which have been tested since 1923 can now be classified broadly as follows:—

PRACTICALLY IMMUNE.

Cedar	Red Rock
Forge	Sindhi
Galgalos, Geeralying	

HIGHLY RESISTANT.

Apollo	Genoa, Goonoo, Garah
Barota Wonder, Bunyip, Bomen	Hunter
Comeback, Clonel 4, Clonel 7	Lawson
Dundee	Nabawa
Exquisite	Rymer
Firbank, Firwhill, Florence, Ford	Sunset

MODERATELY RESISTANT.

Abbott, Austral, Azure	Queen Fan
Baringa	Riverina
Cargo, Cookapoi, Clifton, Currawa	Sands
Gullen	Zealand

SUSCEPTIBLE OR HIGHLY SUSCEPTIBLE.

Aussie, Astor, Auction, Argus, Arrow, Austan, Akubra.
Binya, Bena, Bruce, Bowes, Bald Early, Bobin, Barwang, Bonshaw, Bredbo, Boonoo, Bogan, Burrill, Bunge.
Caliph, Cleveland, College Purple, Craboon, Canimbla, Cowan, Clarendon, Cadia, Condong, Comara, Canberra, Carinda, Capeton, Carlton.
Droophead, Duri, Duchess, Dunmore.
Elfin, Early Bird.
Farley, Federation.
Garra, Girral, Gresley, Gidley, Guinea, Gular.
Hard Federation.
Linden.
Minister, Maharajah, Marshall's No. 3, Major.
Noongar, Nizam, Newman's Early, Nullah.
Ogilvie, Onas.
Quality.
Reilly's, Rajah, Ranee, Richelle Hative.
Sultan, Sovereign, Silver Bart.
Thew, Turvey.
Union.
Wagga 53, Wagga 49, Wandilla*, Wagga 55, Warden, Waratah, Warren, Watchman.
Yandilla King, Yuna.

* **Wandilla proved to be highly resistant at Cowra but very susceptible at Bathurst.**

Best of Present-day Varieties are Susceptible.

It will be seen that, unfortunately, the varieties at present most largely grown in New South Wales are mostly susceptible to flag smut, and that the varieties which are most highly resistant are not grown to any extent, nor are they recommended by the Department, except in the case of a few for certain special districts or conditions. Some highly or moderately resistant varieties are either new varieties which have only recently been introduced to New South Wales or evolved by plant breeders here, and they have not yet been sufficiently tested for the Department to make any recommendation concerning them. Further tests with the most resistant of these varieties and with other new varieties are to be carried on from year to year in special plots at Cowra, Bathurst and Wagga experiment farms, and from the data now available further crosses have been made which are designed to combine high yield and other good qualities with flag smut resistance. In addition, all the existing crossbred wheats of the Department have been reviewed for their possibilities in evolving suitable agronomic types resistant to flag smut, and these are also being subjected to seed inocultaion in the above plots with a view to finally selecting a productive strain which is resistant to the disease. A large range of crossbred material involving at least one resistant parent is thus available, some of which is nearly fixed in type. Thus, from the breeding standpoint, the Department has the situation well in hand.

It will be many years before the present varieties, which are most widely grown but which are susceptible to flag smut, will be entirely displaced. This will only come about if flag smut cannot be sufficiently well controlled by other means, but it is pleasing to reflect that it can be controlled by the growing of resistant varieties, and the work of the plant breeders outlined here indicates that productive flag smut resistant wheats will be available to meet the situation in ample time should the emergency or need arise in the near or distant future.

Dairy Science Schools.

During the next few months the Department of Agriculture has arranged to hold a number of dairy science schools throughout the State for the convenience of dairy produce factory employees who are desirous of qualifying as cream graders and milk and cream testers under the Dairy Industry Act. The centres at which the schools are to be held and the dates are as follows:—Grafton (15th to 19th July), Wauchope (29th July to 2nd August), Tamworth (12th to 16th August), Hexham (26th to 30th August), Wagga Wagga (9th to 13th September), Bega (16th to 20th September), Moss Vale (30th September to 4th October).

Applications for attendance or for further particulars should be made to the Under Secretary, Department of Agriculture, Box 36A G.P.O., Sydney, or to the Director of Dairying, 25 O'Connell-street, Sydney.

Control of Exanthema of Citrus in New South Wales.

F. C. McCLEERY, B.Sc.Agr. Assistant Biologist, and W. B. STOKES, Orchard Inspector.

In a previous article (6) the symptoms and distribution of exanthema, and the conditions under which the disease occurs in New South Wales have been described. The purpose of the present statement is to detail the results of experiments which have been conducted in recent years in the Gosford district for the control of the disease by the use of a Bordeaux spray and of soil dressings of bluestone. At the same time the opportunity is taken of presenting the general experiences in control of the disease both here and in America. Some observations are made on the value of organic manures and of re-soiling, and general recommendations for the control of exanthema in New South Wales are included.

I. CONTROL WITH BORDEAUX MIXTURE SPRAY.

Historical.—Bordeaux mixture has been used in controlling exanthema in Florida, U.S.A., since 1913, but appears not to have been used generally elsewhere. Floyd (4) states that both orchard experience in Florida and experiments carried out by the Florida Agricultural Experiment Station have demonstrated its effectiveness, although not under all conditions. Floyd (3) and Collison (1) first reported having controlled exanthema there by applications of Bordeaux 5-5-50 (British equivalent 5-5-42), in February and April (spring), 1912. They state that in January, 1913, over 56.2 per cent. of the unsprayed trees in their experiment still showed the disease in the gum-pocket stage (the most common symptom), as compared with only 25.7 per cent. of the sprayed trees. Floyd (4) considers that, to be most effective, Bordeaux should be applied just prior to the flush of growth in which the dieback may develop, *i.e.*, in late winter, late spring or late summer; whilst to prevent the marking and dropping of the fruit the spraying should be done after the fruit has set and begun to grow rapidly. He recommends a 3-3-40 Bordeaux (British equivalent 3-3-33). Fawcett and Lee (8) recommend the use of 3-3-50 Bordeaux-oil emulsion (British equivalent 3-3-42) just prior to the flush of growth in which exanthema is expected to develop.

Wickens (9), in Western Australia, has carried out some preliminary experiments with this treatment and found a decided improvement in some trees after a spray application of Bordeaux 3-3-40, but other sprayed trees showed no improvement.

In New South Wales indications have for several years pointed to the effectiveness of Bordeaux, both as a result of Departmental tests and of the experience of growers in the Gosford district, but in no case which has come under observation previously has a very definite improvement occurred

in an area on which satisfactory control (unsprayed) trees have been left for comparison with the sprayed trees. In a Departmental test which was begun at Lisarow in 1922, on a plot of twenty-four Valencia oranges, there appeared to be some improvement in the sprayed as compared with the unsprayed trees until September, 1924. After that date, however, all the trees in the experimental plot recovered from the disease after re-soiling and the experiment had to be discontinued in 1926. The present experiments were commenced in October, 1927, on two orchards on the Mangrove Mountain plateau, about 25 miles from Gosford. Orange, lemon, and mandarin trees were each included in the experiments and the results are detailed separately below.

(a) Experiment with Washington Navel Oranges.

Details of Plots.—The experimental block contained 335 six-year-old Washington Navels growing on a fine sandy soil, well drained and of good depth. Two strengths of Bordeaux mixture were employed, *viz.*, 6-4-50 and 6-4-100, with the addition in each case of 1 per cent. of red spraying oil. The area was divided up into six plots of four rows each, each plot (with the exception of one of fifty-five trees) comprising fifty-six trees. Thus the first four rows were sprayed with Bordeaux-oil 6-4-50, the next plot was left unsprayed as a control or check plot, and the next was sprayed with Bordeaux oil 6-4-100. This arrangement was duplicated in the three remaining plots. In all, therefore, 112 trees received Bordeaux-oil 6-4-50, 111 trees received Bordeaux-oil 6-4-100, and 112 trees were left unsprayed as controls. Only one spray application was made, on 18th and 19th October, 1927, when the trees were just past full blossom and the petals were falling freely.

Fig. 1.—Bordeaux Spraying Experiment with Washington Navel Oranges.

A typical tree before treatment, showing twig dieback and bushy growth. Photographed October, 1927.

The trees at this time were showing a very pronounced and very uniform development of exanthema. Each year previously they had produced large quantities of vigorous young growth, a proportion of which regularly died back. They produced a heavy blossom each season, but the major portion of the fruit which set became pale and fell at an early stage, whilst the remainder showed a high percentage of exanthema markings. The chief twig symptoms were the gum symptoms, bark excrescences and

stained terminal shoots. A bushy rosette-like type of growth was a prominent characteristic, the foliage was dark in colour, and some frenching and leaf mottling were present. Fig. 1 shows a typical tree at the commencement of the experiment.

Results.—The plots were inspected on 25th January, 1928, when a very distinct improvement was observed in all the sprayed plots. The young growth present when the sprays were applied had practically all remained quite healthy in appearance, and had developed normally on the sprayed trees, and the foliage had a normal light green colour. The trees in the unsprayed plots were in marked contrast, with a large proportion of twig-dieback and with the foliage a dark, leaden colour. The fruit on the control trees was typically yellow and spotted with exanthema markings, and later fell; whilst on the sprayed trees it was larger, green and healthy.

Fig. 2.

Fig. 3.

Bordeaux Spraying Experiment with Washington Navel Oranges.

Fig. 2.—A typical tree sprayed October, 1927. Note the healthy growth and the good crop of fruit.

Fig. 3.—A typical control (unsprayed) tree. Note the twig dieback, bunched growth and the absence of fruit. Both photographed April, 1928.

The improvement effected by the sprays continued and the same contrast of healthy growth on the sprayed (Fig. 2), and pronounced dieback on the unsprayed trees (Fig. 3), occurred with remarkable uniformity in the flush of growth in late summer. The difference between the plots was so great—sprayed and unsprayed plots could easily be picked out at a distance of 100 yards—that the owner of the orchard was unwilling under any circumstances to continue the control plots and sprayed them in early April, 1928.

Another inspection was made on 6th July, 1928, and an improvement could then be detected in both of the original control plots which had been sprayed three months earlier. The improvement in these April-sprayed

plots was just as striking as that obtained from the October sprays, except, of course, that there was no young fruit on the trees. There were, however, no control unsprayed trees for comparison.

The experimental sprays were applied at blossoming in October, 1927, and all the control trees were sprayed six months later, in April, 1928, but, since no blossoming occurred on the trees in the interim, the spraying of the control plots could have no effect on the amount of fruit on the trees at harvest (1928). Arrangements were therefore made to record the actual amount of fruit harvested from each plot in order to obtain some idea of the increase in crop resulting from the spray application. The fruit was harvested in September, 1928, and the following are the total figures, given as loosely-packed benzine cases, for each plot:—

SPRAY Treatment.

Bordeaux-oil (6-4-50).	Controls (unsprayed).	Bordeaux-oil (6-4-100).
Plot A —69 cases.	Plot B —18 cases.	Plot C —72 cases.
Plot A¹—52 cases.	Plot B¹— 9 cases.	Plot C¹—44 cases.
Total, 121 cases.	Total, 27 cases.	Total, 116 cases.

NOTE.—All plots contained 56 trees, except plot C¹, in which there were only 55.

It will be seen that—

1. More than four times as much fruit was harvested both from the Bordeaux-oil 6-4-50 and the Bordeaux-oil 6-4-100 sprayed plots as from the unsprayed control trees in an area which a year previously had been remarkably uniform.
2. Bordeaux-oil 6-4-100 and Bordeaux-oil 6-4-50 gave equally good results, the slight difference in favour of Bordeaux-oil 6-4-50 being almost certainly within the limits of experimental error.

No spray application was made in the following season (1928), but the trees set a uniformly good crop of fruit from the October blossom and con[illegible] to make strong healthy growth. A final observation was made on [illegible] May, 1929, eighteen months after the spray had been applied. The tre[illegible] were then maturing a good crop of fine quality fruit from the main blossom. The foliage had, however, again developed some of the secondary symptoms of exanthema (chiefly dark leaves, occasionally linear or showing frenching), and it will probably be advisable to make a second application of Bordeaux in October of this year.

(b) Experiment with Sweet Rind Lemons.

Details of Plots.—A block of six-year-old Sweet Rind lemons in the same orchard as the oranges, and adjacent to them, was treated in the same manner as were the oranges. There were 126 trees, of which forty-two trees (three rows) were sprayed on 19th October, 1927, with Bordeaux-oil 6-4-100, forty-two trees (three rows) were sprayed on the same date with

Bordeaux-oil 6-4-50, and the remaining three central rows of forty-two trees were left untreated as controls. This area also consisted of vigorous young trees showing quite a pronounced and a uniform development of exanthema. The trees, partly as a result of twig dieback and the production of twinned twigs from multiple buds, but principally because of a shortening of the internodes and the development of an abnormally large number of twigs at the tips of the branches, presented a bunched, bushy, rosette-like appearance. The foliage was dark-green in colour. In addition, many of the trees were not bearing fruit and on the remainder the crop was much reduced as a result of fruit fall in the early stages of growth.

Results.—It was not until April, 1928, that any distinct improvement was observed in the sprayed as compared with the unsprayed trees. There was then a pronounced difference, especially in crop, between the two sets of trees. The foliage on the sprayed trees had recovered a normal green colour, whilst the unsprayed trees were still a dark green. No twig dieback was taking place on the sprayed trees, but this was, from the first, a minor symptom on the controls. The sprayed trees were markedly less bunched in appearance than the controls as a result of the development of normal young growth in place of that with shortened internodes and twinned terminal twigs on the control trees. It is possible that these trees, like the oranges, showed some improvement earlier in the year, because exanthema symptoms are rather indefinite on lemons, but the improvement was not considered certain until six months after the spray application was made.

It was not found possible to keep a record of the fruit harvested from each plot in this experiment, but from observations of the fruit on the trees the increase in crop is estimated to have been equally as great as that obtained with the orange plots. Again no differences could be detected between the two sprayed plots, and Bordeaux-oil 6-4-50 and Bordeaux-oil 6-4-100 are considered to have given equally good results. The control plot in this experiment was sprayed in early April, and an improvement could be noticed in the trees in July, two months after spraying.

The trees were not sprayed in 1928, and a final observation was made in May, 1929. As in the case of the oranges, the trees had then again developed secondary symptoms of exanthema and another spraying in October, 1929, is considered necessary.

(c) Experiment with Emperor Mandarins.

Details of Plots.—A block of 176 Emperor mandarins about nine years old in eleven rows of sixteen trees each was available for this experiment. The trees were divided into three plots of three rows (forty-eight trees each). The central plot was kept as a control plot, and the other two were sprayed with Bordeaux mixture 6-4-50. One plot was sprayed on 22nd September, 1927, when the spring growth had developed, but the blossoms were in the very early bud stage with occasional flowers open. The other was sprayed on 17th October, 1927, when the trees were almost in full

blossom. The soil in this orchard is similar to that on which the previous two experiments were conducted—a fine yellow-brown sand—but is considerably finer than the former.

The trees were fairly uniform and of good size at the inception of the experiment, and the chief symptoms of exanthema were the closely bunched growth of the trees, the dark colour of their foliage, and their failure to carry a normal crop. Occasional terminal shoots were stained with gum and had died back. The bunching of the foliage was a result mainly of the shortening of the internodes on the terminal twigs and the production of an abnormally large number of small shoots near the apex of the terminal branches. Some trees showed this bunched, staggy growth to a marked degree, and resembled a clipped hedge in appearance. A considerable proportion of young fruits had each year previously yellowed and fallen, and the owner stated that he had picked less than eighty cases of fruit from the whole block in the previous year.

Results.—A number of inspections were made during the season, and, whilst at various stages there appeared to be a distinct general improvement either in fruit or foliage in the sprayed trees as compared with the controls, no very striking general recovery occurred, such as was observed in the case of the orange and lemon experiments. It can, however, be said that some improvement took place in the growth of the trees in both of the sprayed plots. This improvement was evident principally as a freer, more open type of young growth. A crop record was kept, and the following figures indicate an increase in crop in each of the sprayed plots. The figures only take count of the fruit which reached marketable size. The amounts of unsaleable fruit were not accurately recorded.

SPRAY Treatment.

Bordeaux (6–4–50) before blossom opened.	Control (unsprayed).	Bordeaux (6–4–50) plus oil, just prior to full blossom.
Plot A—53 cases.	Plot B—41 cases.	Plot C—58 cases.

NOTE.—Each plot contained 48 trees.

In certain individual trees in each of the sprayed plots a pronounced recovery took place as a result of spraying. Such trees, when the experiment was begun, were fruitless and showed considerable twig dieback, together with a darker colour and a more pronounced bunching of the foliage than the majority of the trees. They had developed a more normal, open type of growth when seen in July, 1928, and again in January, 1929, than comparable trees in the unsprayed plot. The experiment is being continued this season, and the results are considered, after a preliminary examination on 3rd May, to be of about the same standard as those reported above for the season 1927-8.

II. CONTROL WITH SOIL DRESSINGS OF BLUESTONE.

Historical.—The published experimental data in connection with the use of bluestone (copper sulphate) as a soil dressing are even less than for the Bordeaux spray. As in the case of the spray treatment, the use of bluestone for the control of exanthema originated in Florida, U.S.A., and only there does it appear to have been used to any extent. Floyd ([4]) states that 2 lb. per tree in one application in spring was found an effective treatment for trees more than twenty years old, whereas 1 lb. was not nearly so effective. He refers to Grossenbacher ([5]) who, in treating grape-fruit trees from four to six years old, found a total of not less than 4 lb. per tree to be most effective, given in two applications in March and May (spring). Fawcett and Lee ([2]) recommend the use of from ½ to 1 lb. of bluestone about each tree, depending on the size, and this appears to have been the usual quantity employed in Florida. Wickens ([8]) has obtained some results in Western Australia by treatment with bluestone.

Bluestone dressings had not been used to any extent in New South Wales prior to 1927 or 1928; but in 1928 considerable quantities were applied in the Mangrove Mountain district, and the experience of a number of orchardists there is that the treatment is distinctly beneficial.

Preliminary Experiment with Bluestone.

Details of Plot.—In one small preliminary experiment commenced in the Gosford district in 1926, five orange trees were treated with bluestone, and a number of comparable adjacent trees (untreated) were kept under observation as controls. The soil in this area is a fine grey sand, underlain by hardpan at a depth of about 3 feet. The trees treated were common oranges far from uniform in size and vigour, two being about twenty years old, one about ten years old, and two about six years old. With the smaller trees the bluestone crystals were spread on the soil to a distance of about 5 feet from the butts and chipped in with a hoe. The larger trees were treated by chipping in the crystals in a ring about 2 feet wide just outside the spread of the branches. Four applications, each of 2 lb. per tree, were made, in April and August, 1926, in June, 1927, and in April, 1928.

All five trees in this test had been extremely severely attacked by exanthema for a number of years, and in ordinary orchard practice would have been considered too badly diseased for treatment. Not one of them was producing any marketable fruit, although the three older trees did mature some deformed, marked, and split fruits. In every tree practically all the symptoms of exanthema were in evidence. The two six-year-old trees showed very pronounced twig dieback, accompanied by the gum symptons and multiple buds, resulting in the production of typical, bunched, staggy trees about 5 feet high, with foliage of a dark green colour (Fig. 5). The ten-year-old tree was about 9 feet high, and of the same general character, except that the twig dieback was not causing such a pronounced stunting of the tree. Of the two older trees, one was a normally shaped tree which had become stagnant, and was not producing any vigorous young growth.

One sector showed very pronounced dieback, and the limb was almost dead. Numbers of the small twigs over the remainder of the tree showed the gum symptoms, particularly the staining of the terminal shoots. The leaves were thick and dark green, frequently showing mottling and frenching, and many were long and very thick, somewhat the shape of peach leaves. The other tree was practically dead, a straight trunk about 14 feet high, on which were produced numerous strong water-shoots which invariably died.

Eight adjacent trees selected as evidencing as nearly as possible the same general growth and disease character as the five experimental trees were kept under observation during the course of the experiment, and none of these at any time showed any indication of improvement.

Fig. 4.

Fig. 5.

Experiment with Soil Dressings of Bluestone on Common Oranges.

g. 4.—A six-year-old tree about two years after the first application of bluestone. Note the healthy growth.

Fig. 5.—A six-year-old tree comparable with Fig. 4, but which received no treatment. Note the pronounced twig dieback. Both photographed June, 1928.

Results.—In June, 1926, there was a slight diminution of the twig dieback symptoms on the two young trees, and in November of the same year there appeared to be a slight improvement in two of the older trees. It was not, however, until April, 1927, a little over a year after the commencement of the experiment, that these improvements were regarded as definite. A final observation was made in June, 1928, and the two youngest trees had then completely recovered from the disease. Fig. 4 shows one of these trees, Fig. 5 being a control tree of the same age, which at the commencement of the test was identically similar in appearance to the two treated trees. Two of the remaining trees were distinctly improved, carrying light crops of normal fruit and with practically no twig dieback, but

both had a considerable amount of leaden, thick, pointed leaves. The tree which was worst at the commencement of the experiment, then showed no improvement. In the spring of 1928, however, it made very strong growth, particularly from the lower 6 feet of the stump, and the foliage is now (May, 1929), about 5 feet in diameter, and the tree is carrying about half a case of healthy fruit of very fine quality. The current season's growth on all five trees is practically free from exanthema symptoms.

In comparing these results with those obtained from the Bordeaux spraying experiments it must be remembered that the few trees treated with bluestone were so severely attacked by exanthema that it would not generally be considered feasible to cure them. The results of this test are offered as preliminary ones, not as a comparison with the Bordeaux spraying experiments, but as a proof that the bluestone soil dressing is an effective treatment. There is no reason to believe, from the results, that the soil treatment would be slower in action than the spraying if similar trees were treated in each case. A great deal has yet to be learned as to the most effective rates and times of application of bluestone and experiments with this in view are in progress.

III. GENERAL DISCUSSION AND RECOMMENDATIONS.

Experiments for the control of exanthema have been conducted by this department for at least eleven years. The earlier tests involved the use of explosives for the improvement of drainage conditions, and by this means hardpan had been broken up and the trees improved in condition. The provision of adequate drainage by underground drains has also been found effective. One of the first requirements for a successful citrus orchard is, however, a soil which is well drained and not closely underlain by hardpan and drainage should, therefore, never become a factor in exanthema control. Where the land is badly drained and exanthema occurs, little can be expected from any method of treatment till adequate drainage is provided.

For a number of years the best results were obtained by the addition of organic matter to the soil. Such materials as stable, sheep, and fowl manure and abattoir waste, when obtainable in sufficient quantities, have consistently proved beneficial. The use of a loam or sandy-loam soil for resoiling has also proved effective. The incorpation of large quantities of old leaves and bush scrapings in the soil has given results in some cases. It has, however, become increasingly difficult in recent years to procure these materials and in some districts the cost of obtaining them renders their use prohibitive. They have the important advantage over the copper treatments of being valuable manures quite apart from the role they play in controlling exanthema and wherever possible their use, alone or in conjunction with the Bordeaux spray or bluestone soil treatments, is strongly to be recommended. The growth of green manure crops has not been tested as a preventive for exanthema, but the addition of a bulky (preferably leguminous) cover crop to the soil each year from the

time of planting would certainly improve the general soil condition, and there is a likelihood that it would have some effect in controlling or preventing the appearance of the disease.

Bordeaux mixture sprays and soil dressings of bluestone promise to become the most general treatments for exanthema, both because of their cheapness and the rapidity with which results are obtained. Whilst it is not known how long immunity from the disease can be expected after their use, the trees, in some orchards at least, have remained healthy for two and more years after treatment. The reason for their effectiveness will probably not be demonstrated until more is known of the nature of the disease itself, but it is possible that the copper salts either exercise a direct stimulating effect on the tree tissues, or inhibit the action of some chemical toxic substance or enzyme in the tissue. The only feasible explanation of the success of both treatments appears to be that each is absorbed into the tree, the bluestone through the ordinary root channel and the Bordeaux spray directly into the leaves. In this connection it is of interest that Wallace (7) has shown that potash is absorbed by apple leaves from a solution of potassium sulphate sprayed onto the trees.

The general orchard experience is that young vigorously growing trees, such as those used in the spraying experiments, respond most markedly to treatment, and results similar to those reported cannot always be expected in the case of older trees (say, ten years old and upwards) which have become stagnant and are not capable of producing vigorous flushes of young growth. In their case one spray application usually produces an increase in fruit production or a lessening of fruit marking, but may not eliminate the disease from the foliage. Oranges and lemons respond better than mandarins, but even in the latter case the results are sufficient to warrant the expenditure involved.

A considerable number of orchards in the Gosford district have been sprayed with Bordeaux mixture in the last few seasons, and, whilst the majority have been sprayed around blossoming time in October, there are a sufficient number of instances of successful spraying at other periods of the year to suggest that good results are obtainable practically at any time. In view, however, of the excellent results which have been obtained by spraying at about the full-blossom stage it is recommended that the spray be applied then. In cases where the trees are attacked by scab or melanose, the spray application should be timed to coincide with the stage of blossoming at which best control of these fungous diseases is obtained ([9] and [10]).

Bordeaux mixture 6-4-100 has proved equally as effective as stronger solutions of Bordeaux in departmental tests and this strength is recommended. The addition of oil (1 gallon to 100 gallons of spray) to the Bordeaux seems desirable. It gives the spray a much better spreading power, and is more convenient to use than other spreaders. It possibly aids also in preventing the increase of scale insects after the use of Bordeaux in situations where fungus parasites of the scales are prevalent. All of

the brands of miscible red spraying oil on the market make a good emulsion with Bordeaux mixture, as also do the newly introduced white oils. The Bordeaux mixture should be prepared as recommended ([11]), and then the oil, which has previously been emulsified with an equal quantity of water in the usual way, carefully stirred into it.

Injury is liable to occur if the trees are fumigated within six months of spraying with Bordeaux mixture, but no damage is likely to take place where the spray is applied after fumigation. An oil spray may be used before or after Bordeaux with safety.

The available data in regard to the bluestone treatment are meagre, but here again it is probable that results are obtainable from applications almost at any time. It is tentatively suggested that an application of 1 to 2 lb. per tree for trees up to six or eight years old be made in later winter or early spring. Older trees may be given up to 4 lb. per tree. American experience, however, suggests that smaller quantities may be equally effective. A second application may be made in November or December. The bluestone should be scattered on the soil around the trees in the same way as a fertiliser, and then either chipped or harrowed in.

Cases of injury as a result of the use of relatively small quantities of bluestone have occurred when dry weather has been experienced after the bluestone has entered into solution in the soil. On the other hand, quite large dressings—up to 15 lb. per tree—have been given in experimental work without injury.

The Bordeaux and bluestone treatments will probably be found equally effective. The latter has the advantage of being more easily applied. Bordeaux, however, should always be used in cases where scab or melanose are also present on the trees, because it is an effective spray for all three diseases.

SUMMARY.

1. Experiments are reported in which a very pronounced and uniform recovery from exanthema took place on Washington Navel oranges and on Sweet Rind lemons as a result of single spray applications of 6-4-50 and 6-4-100 Bordeaux-oil emulsion at blossoming in October. The spray treatment was also effective on mandarins, although the results were not as striking as with oranges and lemons.

2. The results from a small test with bluestone as a soil dressing on common oranges indicate that this treatment is also effective. Good results have followed the use of this treatment by a number of orchardists in the Gosford district.

3. The use of 6-4-100 Bordeaux-oil emulsion applied preferably at the October blossoming, or of bluestone at the rate of 1 to 2 lb. per tree for trees six to eight years old, applied in late winter or early spring, are recommended.

4. The importance of the selection of an orchard site with good drainage is emphasised. When drainage is bad, this should be remedied by under-draining, or, in cases where a hardpan exists, by breaking up the hardpan. Trees should not be planted on hardpan country.

5. The use of farmyard manure, abattoir waste, and other such materials, or of a good soil for re-soiling, is recommended, when obtainable, and the regular growth of green manure cover crops in young orchards is suggested.

Acknowledgment.

Acknowledgment is made to Mr. G. C. Thompson, and to Messrs. Glennie Bros. and Kingsmill Bros., through whose co-operation the trees were made available for the experiments.

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Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1929.

Forbes Sheep Show (K. O. Anderson)	July	10, 11
Narandera Sheep Show (J. D. Newth)	,,	16, 17
Wentworth (W. B. Crang) ..	,,	16, 17
Peak Hill (R. H. Bentley) ..	,,	23, 24
Cootamundra Sheep Show ..	,,	24, 25
Young Sheep Show (T. A. Tester)	,,	31, Aug. 1
Tullamore (S. Cameron)	,,	31, ,, 1
Trundle (W. P. Forrest)	Aug.	6, 7
Gilgandra (G. Christie)	,,	13, 14
Condobolin (J. M. Cooney) ..	,,	13, 14
Illabo	,,	14
Lake Cargelligo	,,	20, 21
Wagga (F. H. Croaker) . ..	,,	20, 21, 22
Bogan Gate (J. T. A'Beckett) ..	,,	21
Junee (G. W. Scrivener)	,,	27, 28
Grenfell	,,	27, 28
Parkes (L. S. Seaborn)	,,	27, 28
Ungarie	,,	28
West Wyalong	Sept.	3, 4
Corowa (H. G. Norton)	Sept.	3, 4
Forbes (K. O. Anderson)	,,	3, 4
Young (T. A. Tester)	,,	4, 5
Ganmain (C. C. Henderson)	,,	10, 11
Cowra	,,	10, 11
Albury (A. G. Young)	,,	10, 11, 12
Barmedman..	,,	11
Canowindra..	,,	17, 18
Temora	,,	17, 18, 19
Murrumburrah	,,	24, 25
Barellan	,,	25
Boorowa	,,	26, 27
Ardlethan	Oct.	2
Quandialla	,,	2
Narandera (J. D. Newth).. ..	,,	8, 9
Manildra (P. Rubie)	,,	8, 9
Ariah Park	,,	9
Bribbaree	,,	9
Griffith	,,	15, 16
Carcoar	,,	16
Cootamundra (R. D. Beaver)....	,,	22, 23

The Processing of Beeswax.

W. A. GOODACRE, Senior Apiary Instructor.

THE production of beeswax is of much importance to the apiarist. To the small man it means a supply of the all-important commodity, comb-foundation, which can be made up from it cheaply, and to the commercial apiarist it means, in a fair season, a good sum towards paying expenses or the purchase of some improved plant.

We should endeavour to maintain a good market for beeswax, and this can only be done by exercising care in the processing work, for a well-treated product is always attractive to buyers. With general care on the part of apiarists there would be less looking around by buyers for substitutes, and a point worth noting is that the substitutes are always attractively processed.

If apiarists send along good bright beeswax of good texture for comb-foundation manufacture they will, in return, gain by an improvement in this commodity which will mean better combs. More general care in the processing work would have a far-reaching effect.

In this short article the methods described are not elaborate, for the general apiarist has no steam plant and other apparatus on hand.

Beeswax is produced in the ordinary line of apiary work from the cappings removed from the combs of honey during the extracting process, or from the melting up of faulty combs. With ordinary care in the processing work, an attractive product should result.

A Few Essentials to Success.

Care should be exercised in the handling and treatment of the wax from the time the combs are removed from the hive. Beeswax should not be overheated or subjected to lengthy drying; the overheating has an effect on the colour, brightness, and texture, while the drying also affects the texture. The best tank water should be used in melting work, for mineralised water from springs, &c., may destroy both quality and colour of the wax. Where steam and wooden casks are not available, tinned vessels should be used. Under no circumstances should heated beeswax be allowed to come in contact with galvanised iron. The successful processing of large quantities of beeswax at the Wauchope Government Apiary is attributable solely to the strict observance of these points.

The Melting Process.

The blocks of beeswax from the Beuhne reducer, or from a solar wax extractor, need to be further processed before sending to market, and a simple yet effective method of refining the blocks is as follows:—

Select a few bright, sound benzine tins; cut out the tops, and fix strong wire handles—the strong handles are necessary for convenience in lifting on and off the fire. Stand the tins on bricks built up to the height of

about a foot, and arranged so that a fire can be built under the tins. If bricks are not available, a furnace may be made by placing strong, old benzine tins, head on, in two rows close enough together to provide safe seating for the melting tins. A double row of tins on one side is convenient, enabling the placing of tins of melted wax aside to allow impurities to settle.

The melting tins are then one-third filled with water, and the fire lighted under them. Chop up the blocks of wax fairly fine, and place them in the tins until each is within a couple of inches of being full. Keep a slow fire going, and watch the melting mass carefully; do not allow it to boil. When a tin full is melted up, stand it aside, say, for about ten minutes or so, to allow the impurities to settle. Dip off the clear beeswax down to the impurity, and strain through a piece of hessian or sound, clean chaff-bagging, into a clean benzine tin, or a tinned vessel with flanged sides for convenience. Do not put any water in the tins into which the melted wax is strained. Two tins of the wax from the melting tins should fill one tin with the strained product. The tins of strained wax should be placed in a room and covered carefully to ensure of the wax cooling slowly.

The water in the melting cans may be used for several lots of wax, but after using a few times, it is advisable to strain off the impurities, and start afresh.

The fully processed wax should not be removed from the tins for a couple of days to allow good cooling down. All that need be done before despatch to market is to scrape off the slight impurities from the lower side of the block, and polish a little with a soft rag all around.

Treating Faulty Combs.

Faulty combs may either be cut from the frames and placed in the melting cans, or melted from the frames by immersion and twisting and turning in very hot water. The water may be heated in tins as previously described, the tins in this case being a little over half full. When sufficient of the mass of comb and water is in the tin, keep on a slow fire until it is well melted, stirring occasionally. The melted mass is then poured into a sound sack in the wax press, the sack folded over neatly, and the screw pressure applied. As each tin is completed, the hot water and wax obtained from the press should be poured into a small tank. The water can be drained off from the tap of the tank for further use in the melting work. The blocks of wax obtained by this operation need to be further processed by the method first described to obtain the best result.

Great Britain's Butter Imports.

The butter imports into Great Britain for the first quarter of 1929 amounted to 85,000 tons and were 2,000 tons less than the first quarter of 1928. Supplies from the more important sources were:—Denmark, 24,000 tons; Australia, 14,000 tons; and New Zealand, 31,000 tons.

NECESSARY

BOOKS

FOR THE

Farmer, Grazier, Orchardist and Vegetable Grower.

Issued from

THE GOVERNMENT PRINTING OFFICE.

Ill-effects of Bracken Fern on Stock.

H. R. SEDDON, D.V.Sc, and T. T. McGRATH, M.R.C.V S.*

In districts where the common bracken fern grows there occur, especially during times of drought, cases of sickness and mortality in stock, the principal features of which are (*a*) loss of condition, (*b*) diarrhoea and dysentery, and (*c*) death, as a rule, after a comparatively short period of illness, or, less commonly, only after two or three weeks. In the cases where the animals die after a short but rapid illness there is marked fever, and the symptoms of inflammation of the bowels are also very marked. If such animals are subjected to a post-mortem examination, the characteristic features are (*a*) ulcerations in the stomach and intestines, and (*b*) heamorrhage in various parts of the body. For this reason certain authorities have considered that the losses are due to haemorrhagic septicaemia, and not to the effect of eating bracken. This receives support from the fact that many animals are known to have access to bracken and to nibble it at least occasionally without ill effects, and also from the fact that the acute illness does not occur immediately the stock eat bracken in quantity, but only after several weeks. The idea of stock dying of an acute illness (with death in a day or two) brought about by feeding for a month or more does not commend itself to stockowners.

It was shown some years ago in England that young cattle fed on bracken might contract such an acute illness after about a month's feeding and die after a rapid illness, manifested chiefly by high fever and dysentery. These experiments were repeated at Glenfield Veterinary Research Station, and it was found that, although animals did, at times, die after a month's feeding, in other cases they did not. The investigations have since been continued, and further investigations of these cases showed that they died, not from some poisonous substance from the bracken, but from a microbic disease, to wit, haemorrhagic septicaemia. It is this microbic disease which is responsible for the symptoms of fever and dysentery and the lesions of haemorrhagic septicaemia. It was found, however, that the microbe associated with this disease is not capable of producing ill effects in healthy stock. Thus one is now able to understand why it is that bracken sometimes leads to death and at other times does not. The mortalities are due to a twofold cause—firstly, to the bracken, which lowers the resistance of the animal, and, secondly, to the microbe, which is able to cause symptoms and death in an animal so weakened by eating bracken. If, therefore, the microbe does not get into the animal, the bracken does not produce harmful effects.

* An account of investigations carried out at the Glenfield Veterinary Research Station.

It may be mentioned that in England there has been much controversy as to whether bracken is really poisonous. Some have asserted that it is and others have just as strongly affirmed that it is not, and that the disease is haemorrhagic septicaemia. The truth is that it is haemorrhagic septicaemia in an animal whose resistance has been lowered by the effect of bracken.

Thus, investigations in Australia have shown the relationship of the two conditions, and that bracken is to be regarded as a very harmful foodstuff, just as harmful as if it were indeed poisonous, for there is no doubt that at certain times very many animals die of haemorrhagic septicaemia brought about by eating bracken.

TUBERCLE-FREE HERDS.

OF the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number tested.	Expiry date of this Certification.
Lunacy Department, Parramatta Mental Hospital	97	6 July, 1929
E. P. Perry, Nundorah, Parkville (Guernseys)	26	12 ,, 1929
P. F. Mooney, Calala	33	16 ,, 1929
Sacred Heart Convent, Bowral	10	21 ,, 1929
Dominican Convent, Moss Vale	4	26 ,, 1929
St. Patrick's College, Goulburn	8	26 ,, 1929
Presbyterian Ladies' College, Goulburn	4	26 ,, 1929
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	42	9 Aug., 1929
Kyong School, Moss Vale	2	21 ,, 1929
Department of Education, Mittagong Farm Homes	34	23 ,, 1929
Blessed Chanel's Seminary, Mittagong	4	25 ,, 1929
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	75	25 ,, 1929
Walaroi College, Orange	5	30 ,, 1929
Riverstone Meat Co., Riverstone Meat Works, Riverstone	121	5 Sept., 1929
J. L. W. Barton, Wallerawang	22	11 Oct., 1929
W. McLean, Unanderra	44	1 Dec., 1929
Department of Education, Brush Farm, Eastwood	8	5 ,, 1929
Lunacy Department, Morisset Mental Hospital	21	7 ,, 1929
J. Davies, Puen Buen, Scone (Jerseys)	39	12 ,, 1929
Kinross Bros., Minnamurra, Inverell (Guernseys)	78	14 ,, 1929
Lunacy Department, Callan Park Mental Hospital	22	19 ,, 1929
Miss Brennan, Arrankamp, Bowral	14	20 ,, 1929
E. S. Cameron, Big Plain, Narrandera	39	10 Jan., 1930
A. Shaw, Barrington	36	11 ,, 1930
Lunacy Department, Rydalmere Mental Hospital	68	11 ,, 1930
G. A. Parrish, Jerseyland, Berry	77	12 ,, 1930
New England Girls' Grammar School, Armidale	24	16 ,, 1930
G. Miller, Casula	15	1 Feb., 1930
Queanbeyan Municipality (various owners)	41	1 ,, 1930
St. Joseph's Convent, Reynold-street, Goulburn	5	19 ,, 1930
St. John's Boys Orphanage, Goulburn	9	19 ,, 1930
St. Michael's Novitiate, Goulburn	5	20 ,, 1930
Department of Education, Yanco Agricultural High School	82	23 ,, 1930
Lunacy Department, Kenmore Mental Hospital	81	28 ,, 1930
St. Joseph's Girls' Orphanage, Kenmore	9	1 Mar., 1930
Tudor House School, Moss Vale	8	6 ,, 1930
Department of Education, Hurlstone Agricultural High School ...	42	10 April, 1930
Navua Ltd., Grose Wold, via Richmond (Jerseys)	10	11 ,, 1930
Australian Missionary College, Cooranbong	48	17 ,, 1930
Department of Education, Gosford Farm Homes	87	24 May, 1930
William Thompson, Masonic School, Baulkham Hills	27	24 ,, 1930
F. W. Hopley, Leeton	29	29 ,, 1930
J. F. Chaffey, Glen Innes (Ayrshires)	54	29 ,, 1930
P. Ubrihien, Corridgeree, Bega	119	8 June, 1930

—MAX HENRY, Chief Veterinary Surgeon.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36A, G.P.O., Sydney, not later than the 12th of the month.

Wheat—

Canberra	Manager, Experiment Farm, Condobolin.
	Manager, Experiment Farm, Trangie.
Clarendon	C. T. Anderson, Swan Vale
Cleveland	W. Burns, Goongirwarrie, Carcoar.
Federation	E. J. Johnson, Wongalea
	Manager, Experiment Farm, Temora.
Florence	Manager, Experiment Farm, Trangie.
Hard Federation	Manager, Experiment Farm. Trangie.
Nabawa	Cullen Brother , Dubbo.
Queen Fan	C. T. Anderson, Swan Vale
Turvey	Manager, Experiment Farm, Temora.
Union	Manager, Experiment Farm, Temora.
Waratah	R. O. Stiles, Narromine.
	E. J. Johnson, Wongalea.
	R. J. Stocks, Cunningar.
	Manager, Experiment Farm, Condobolin.
	G. T. Troy, Bland, Quandialla.
	Manager, Experiment Farm, Trangie.
	C. T. Anderson, Swan Vale.
Yandilla King...	R. O. Stiles, Narromine.
	Manager, Experiment Farm, Temora.

Onions—

Early Improved Hunter River	S. Redgrove, Sandhills, Branxton.
Early White Hunter River ...	S. Redgrove, Sandhills, Branxton.
Hunter River Brown Spanish	C. J. Rowcliffe, Fairfield, Dubbo.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Infectious Diseases Reported in May.

The following outbreaks of the more important infectious diseases were reported during the month of May, 1929:—

Anthrax	Nil.
Blackleg	10
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia contagiosa	16
Swine fever	Nil.
Contagious pneumonia	Nil.

—Max Henry, Chief Veterinary Surgeon.

Orchard Notes.

July.

C. G. SAVAGE and W. LE GAY BRERETON.

Pruning.

IN the inland parts and on the tablelands the weather, generally, has been favourable for pruning operations. The coastal districts are earlier in this respect, and if the work is not yet completed it should be pushed on with so as to allow plenty of time for the many jobs requiring attention in the spring.

Peach trees that were badly affected by green aphis last season are showing much immature fruiting wood. As a rule it is not wise to depend on such wood to set a crop, but as many of the trees have practically no mature fruiting wood there is no choice, and hence immature wood must be left in preference to leaving none at all. Nobody can say with certainty whether this immature wood will set a satisfactory crop or not, but there is consolation in knowing that a good crop under such conditions is not an impossibility.

Ploughing.

Every effort should be made to complete the winter ploughing by the end of this month. If the land is carrying either a sown or volunteer crop, early ploughing gives this ploughed in matter a chance to rot before the spring, and thus makes available any plant food it contains at a time when the trees require it most, that is, in the spring. Moreover, the nitrifying bacteria which assist in the decomposition of this organic matter need nitrates to support them in carrying on their work. They thus use the available nitrates in the soil and temporarily lock them up. This is an advantage during the winter months, as it saves the nitrates from being washed out while the trees are dormant or partially so. But if ploughing in of such matter is delayed until spring, the available nitrates are locked up just at a time when they are most needed by the trees.

Even where the soil is not carrying a green crop, early ploughing is beneficial. It puts the soil in the best condition to absorb any rain that falls, and enables it readily to soak down to the subsoil. Where the land was ploughed in the autumn or some time later, and is still in a suitable condition to absorb moisture, and if the land is not carrying a heavy crop of weeds, then, of course, the ploughing can be delayed.

Manuring.

Where fertilisers, such as bonedust, blood and bone, and superphosphate, are used, they can be applied and ploughed in at this time. But nitrogenous manures, such as sulphate of ammonia, should not be applied till a

week or two before the trees start into growth in the spring, otherwise, being soluble, much of them is lost. Though sulphate of ammonia is soluble it is not directly available to the trees, and must be given a little time to be converted into nitrates. On the other hand, nitrate of soda is directly available to the trees as soon as it is dissolved by the moisture in the soil, hence its application may be made slightly later than sulphate of ammonia. From certain remarks made in reference to the ploughing in of green crops it will be gathered that the winter is also the best time for ploughing in fresh stable manure or other undecomposed bulky organic matter, in order that it may have time to rot before the spring.

Leaf Curl.

Except in the case of some of the early coastal varieties of peaches, which blossom during July, this month is a good time to apply either lime-sulphur or Bordeaux mixture (winter strength) for the control of leaf curl. See that the laterals right to the tips, as well as the main limbs, are thoroughly sprayed.

San Jose Scale.

Miscible oil sprays for San Jose scale can be applied this month to all varieties except those early blossoming varieties already mentioned. Where it is preferred to use lime-sulphur for this pest, it is better to delay application until the buds are well swollen.

Green Peach Aphis.

In recent years, miscible oil spray, diluted one to twenty parts of water by volume, which proved most successful in Departmental tests and elsewhere in the north, has not been generally satisfactory, and consequently the Entomological Branch has included this pest in its field investigations. Up to the present the following treatment has given the best results in these field trials. Nicotine sulphate (40 per cent.), diluted 1 to 600 parts of water by volume, to which soap is added at the rate of 1 lb. to every 25 gallons of spray, is applied just before the buds burst, or when they are showing colour.

Be on the look out for black cherry aphis, but remember that the miscible oil spray (one to twenty parts of water by volume) should not be applied till the buds are well swollen and the cover scales of the buds lifted slightly.

A Warning.

The application of copper sulphate (bluestone) to the soil for combating exanthema is apparently giving good results both in tests carried out by the Biological Branch of this Department and when used by growers.

At present the action of the copper sulphate is not fully understood. It may be merely correcting some condition in the soil, or the trees may be absorbing, in one form or another, either the copper or the sulphur, or both, supplied by the copper sulphate, thus enabling the tree to overcome the exanthema conditions.

Copper sulphate in small doses acts as a stimulant, but in larger doses is a poison to plant life. Hence growers should limit its use only to those trees which need it, and in doses not larger than is prescribed in the article by Mr. McCleery, Assistant Biologist, in this issue of the *Agricultural Gazette.* Moreover, they should not continue the treatment any longer than is necessary.

It should also be borne in mind that although copper sulphate stimulates growth, it would be contrary to expectations if it is ever proved that copper sulphate can take the place of nitrogenous or phosphatic fertilisers.

The Recognition of Sex in Hen's Eggs.

In some countries there it a widely-held opinion that elongated eggs give rise to pullets and round eggs to cockerels. According to Lienhardt the eggs of a pure breed of fowls can be divided into two groups by weight, the heavier group producing cockerels and the lighter pullets.

Experiments to test whether there was any foundation for these opinions have been carried out in Italy, and the conclusion has been arrived at that a classification of eggs into two groups based on weight or shape has no bearing on the sex of the chickens.

It has been possible, however, to recognise a very slight difference between the average weight of eggs giving rise to cockerels and those giving rise to pullets; the latter weighed about 6.6 gm. more than the former. No connection between the shape of eggs and the sex of chickens could be established.

Action of Frost on Soil.

It is known that frost is one of the principal agents in the disintegration of rock, and in its transformation and final conversion into soil. This action continues to be exercised on the soil, increasing the proportion of fine particles, but with extreme slowness. On the other hand, frost has an immediate effect on soil colloids; *e.g.*, it breaks up compact clayey soils into separate lumps. According to Ehrenberg this effect is not due solely to the expansion of the interstitial water, but also to the growth of ice crystals. The resulting lumpy texture increases the permeability and æration of the soil, which tends to dry it and facilitate its cultivation without risk of its again uniting into a solid mass. The solidification is apt to be renewed, however, as a result of heavy spring rains, also in many vegetable soils. Attempts have often been made to attribute the beneficial effect of frost to the fact that it renders soluble the nutritive elements in the soil, but this could not be conclusively proved experimentally. On the other hand, it has been shown that the total surface of the particles of a granite soil has increased by 6.13 per cent. after exposure to frost. This effect is directly beneficial to plant growth, which shows that the old saying, "If the ground does not freeze the crop will be thin," has not lost its meaning in countries with a cold winter.

Poultry Notes.

July.

E. HADLINGTON, Poultry Expert.

The beginning of this month should see the hatching season well started, and the main consideration now is to ensure that the management of the young chicks is such as to give them every chance to grow into profitable birds. The best results cannot be expected from birds that have had serious setbacks during rearing, and any check experienced by chickens during the brooding stage, or afterwards, has its effect on the ultimate development of the birds, and results in lower returns. Therefore, no effort should be spared in endeavouring to keep the chickens in robust health, and thus secure the best development.

Poultry-farmers should not be satisfied merely to rear their chickens without serious losses, as there is a great difference between just keeping them alive and ensuring maximum development and good health. One of the essentials of successful chicken rearing is to know just when proper growth is being maintained, and it is sometimes necessary for a farmer to see the results obtained by others before he can be certain that his own chickens are doing as well as they should. The accompanying illustrations may be of some assistance in this direction. They depict well-grown chickens of three, five, seven, and nine weeks old.

Points on Rearing.

In dealing with this important question it is realised that there are probably many beginners among the readers of these notes, and for this reason it is proposed to cover the handling of the chickens from the time of hatching.

A fundamental of successful chicken raising is an infinite capacity for details, because it is the little points which make all the difference between success and failure.

Hatching Time.

From the time the eggs begin to chip, until the hatch is over, the following matters should be kept in mind. After chipping commences, the door of the incubator should not be opened except in case of emergency. If an exceptionally good hatch is coming off and the chickens are crowding unduly on the trays and appear likely to become smothered, the door can be opened and some of the chickens taken out, otherwise, apart from keeping the temperature at the right level, the machine should be left alone until the hatch is completed. The mistake should not be made of leaving the chickens in the incubator too long after hatching, and as soon as the hatch is over the remaining eggs and shells should be taken out and a little extra ventilation allowed. This can be effected by wedging the door open slightly with a piece of paper, but the temperature should be kept at about 100 deg. Fah. Many chickens are harmed by leaving them in the incubator too

long without proper ventilation. Shortly after all the chicks are properly dried off they can be taken out, and in removing them to the brooders care should be exercised to see that they do not become chilled. A shallow flannel-lined box is best to use for transferring the chickens to the brooders.

Operating the Brooders.

In commencing the season it is advisable to start up the brooder well before the chickens are due, so that it can be ascertained if everything is working satisfactorily before they are put in. The temperature should be standing steadily at about 90 deg. Fah., and when the chickens are put

Three Weeks Old.—Well-grown Chickens.

in it may be allowed to rise to 95 deg., or even a little higher. The floor of the brooder should be covered with a thin coating of clean river sand, and provision should be made to keep the chickens close up to the source of heat. This can be done in the case of brooders such as those operated on the hot water system by having a movable partition about 12 inches high in the run, weighted with a block of wood so attached that it can be stood in any position desired. This also applies to cold brooders, only that two, three, or four such movable boards may be necessary to form an enclosure, according to the position of the brooder.

In the case of the colony type of brooders, two half-circular wire-netting frames about 18 inches high, covered with hessian or sacking, can be placed around the brooder in such a position as to allow of the chickens moving away from the brooder if the heat becomes too great, and yet not allow them to stray too far. This also serves the purpose of keeping off direct floor draughts. The frames must be made long enough so that they can be extended to suit varying numbers of chickens, and to be enlarged as the chicks get older. After a few days, of course, the frames would be taken away in the daytime, and used only at night until the chickens are a few weeks old; except in the case of a draughty shed, when it may be desirable to use them for a longer period. The secret of successful brooding with heated brooders is to be able to maintain sufficient heat at all times so as to prevent the chickens huddling, and yet at the same time allow ample ventilation.

If the vital importance of this factor was more generally recognised there would be far less mortality among young chickens. Most of the chicken troubles are either directly or indirectly caused by the chickens crowding together to get warm. This leads to sweating, which in turn causes chills, followed by sickness probably two or three days afterwards, and often the cause is unsuspected. It is better to err on the side of keeping the temperature a little too high than too low, provided more ventilation is allowed and the chickens are free to move away from the heat. It must be borne in mind, however, that to maintain a high temperature without adequate ventilation is as bad as a temperature that is too low. As a guide to the

Five Weeks Old.—And Well-grown.

temperatures required for chickens of various ages the following scale is given:—

1st week	95 to 90 degrees Fah.
2nd ,, ...	90 to 86 ,, ,,
3rd ,, ...	86 to 82 ,, ,,
4th ,, ...	82 to 78 ,, ,,
5th ,, ...	78 to 74 ,, ,,
6th ,, ...	wean off heat.

If possible, it is advisable in the cold weather to keep the chickens in the brooders a week longer. Working to these temperatures has been found by practical experience over many years to give the best results. Not only should the temperatures stated be maintained at night-time, but it is just as essential that the heat be kept up in the daytime.

Stoke up Early.

A practice should be made of stoking up the brooder heater at least an hour before the chickens are due to go up for the night, so that the brooders will be thoroughly warm for them to go into. Any cooling off at that time will result in the chickens huddling to get warm, and if this continues for half an hour or so sweating will often result. Even though the temperature is kept up well, there is a tendency for the chickens to crowd when they first go up at night, and for this reason it is desirable that the attendant

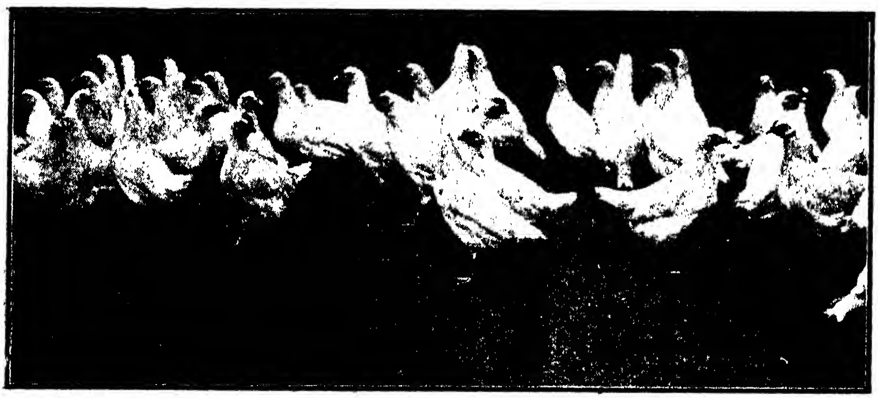
be on duty at that time so as to see the chickens comfortably settled down, and then regulate the temperature to the required level. Another inspection should be made midway between the time the chickens go up and the final stoking for the night, for the purpose of regulating the temperature again.

Avoid Overcrowding.

A mistake that is often made, and which is the cause of many losses among chickens, is to fill all the brooders to their capacity with chicks just hatched and thus leave no room for thinning out as they grow. It should be remembered that if a brooder is filled to its capacity at first, the numbers of chickens will require to be reduced to about half by the time they are ready to leave the brooders.

Feeding.

Chickens do not require any food for thirty-six to forty-eight hours from the time of hatching, but this should not be construed to mean from the time they are taken from the incubator, or, in the case of chickens pur-



Seven Weeks Old.—Another Pen of Well-grown Chickens.

chased, from the time of their arrival, because very often a day or more may elapse between the actual time of hatching and their being placed in the brooders. Cases have come under notice where chickens have been fasted for as long as three and four days because it was feared that the yolk may not be absorbed. The result has been that many of the earliest hatched chicks just wasted away and died and others did not develop. What happens in such cases is that after the chickens have gone beyond a certain time without food they lose any desire for it and then refuse to eat.

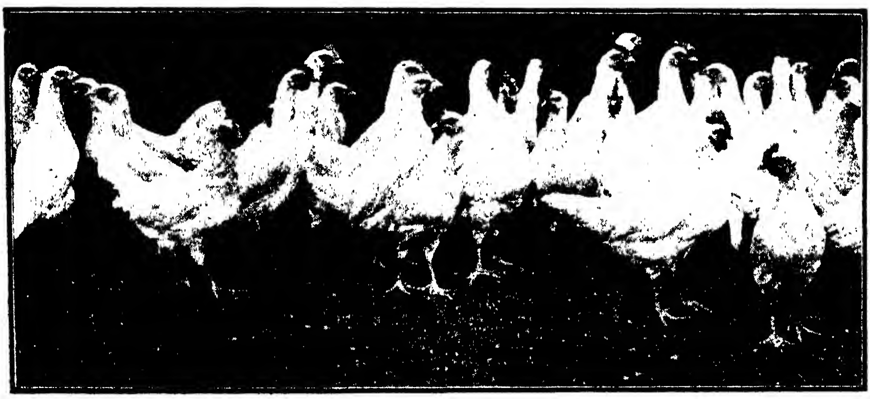
The first feeds should be dry rolled oats, which may be given for two days only, not any longer, and then moist mash should be given four times a day, with one feed of chicken mixture for the last feed of the day. Water should be made available as soon as the feed is given. Fine shell grit should also be supplied and kept before the chickens constantly.

The method of feeding adopted by the Department and found to result in the best development of the chickens is as follows:—

1. *From two days to six weeks.*—Four feeds of moist mash are given and one of chicken mixture for the last feed of the day. The mash consists of approximately one-quarter to one-third by weight of bran to three-quarter or two-thirds of pollard, according to whether the pollard is coarse or fine. M.I.B. bonemeal is added to two feeds per day at the rate of one ounce to each pound of pollard and bran, and the mash is mixed with hot skim-milk or skim-milk powder dissolved in hot water at the rate of one pound to the gallon. Common table salt is dissolved in the liquid, using one ounce to each five pounds of dry matter to be mixed.

The method of mixing is to pour the liquid over the bran and then add the pollard to make a crumbly mash which will just hold together when pressed in the hand and yet crumble again when put in the trough.

2. *Six to twelve weeks.*—After the chickens leave the brooders the number of mash feeds is reduced to three, and the mash is mixed somewhat more moist, but the ingredients are the same as for chickens up to six weeks old.



Nine Weeks Old.—Showing Well-grown Chickens of that Age.

For the evening feed finely cracked maize and wheat are given instead of the chicken mixture, but the chickens are gradually accustomed to the large grains by mixing some with the chicken mixture before a complete change is made. About one-third of cracked maize to two-thirds wheat is used, but the maize can be increased if desired.

3. *Twelve to twenty-four weeks.*—The morning mash after the twelfth week is the same as that given to the adult birds, which is as follows:—

Pollard	60	lb.
Bran	20	,,
Green cut lucerne, lucerne meal, dust or chaff ...	14	,,
M.I.B. Meat Meal	6	,,
	100	,,

A midday meal of mash without any meat meal is given, and the evening feed consists of wheat and cracked maize. The proportion of maize can

be from one-third to one-half or even more according to price, but the alteration should be gradual.

Use Judgment in Feeding.

One of the main factors in feeding chickens or adult birds is to give them just as much as they require without having food lying about between feeds. The aim should be to have the birds keen for each feed and yet not underfeed them.

The best results cannot be obtained where there is feed strewn about the pens all the time, which, apart from the wasteful aspect, is likely to cause bowel troubles.

The food must be palatable in order that the chickens will eat sufficient for good development.

Rice Importations into New Guinea.

During the year 1927-28 the Territory of New Guinea imported 124,005 centals of rice, valued at £89,346.

From the 1st July, 1928, to 30th November, 1928, the imports amounted to 76,304 centals, valued at £51,973, and the principal countries of origin and their supplies were as follows:—

	Centals.	Value. £
Burma	57,713	39,533
India	9,532	6,690
China	6,354	4,478
French Indo China	2,452	1,084

In view of the increased production of rice in the Murrumbidgee Irrigation Area and the fact that Australia will have a surplus for export, New Guinea should in the near future offer a market for the Australian product.

Cottonseed Meal as a Feed for Dairy Calves.

Owing to the general opinion that cottonseed meal contains a poisonous principle, this feeding stuff is seldom recommended as a feed for calves, states the *Journal of Dairy Science,* in publishing a preliminary report on the effect of feeding cottonseed meal to growing dairy heifers.

Cottonseed meal injury in cattle is similar to, if not identical with, the injury produced when too much concentrates in proportion to roughage is fed.

At least two pounds of cottonseed meal daily can be fed to calves five months of age or older, which receive all the silage and hay of good quality they will eat.

There was no appreciable difference in the sleekness of coat and pliability of hide between the heifers receiving cottonsed meal and linseed meal.

There was no appreciable difference between the rate of food passage through the digestive tract by the heifers receiving cottonseed and linseed meal.

There was no measurable difference in the consistency of fæces excreted by the two groups of heifers.

CONTENTS.

VOL. XL. PART 8. AUGUST 1, 1929.

Agricultural Gazette of New South Wales.

Fodder Conservation Competitions.

CHAMPIONSHIP AND DISTRICT REPORTS.

THE R.A.S. CENTRAL SOUTH-WEST CHAMPIONSHIP.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.

THIS was the first championship competition confined to the Central South-west Division and the response to the efforts of the Royal Agricultural Society can be regarded as encouraging, particularly in view of the very adverse season. The lack of rain during the winter and spring of last year was not favourable to the production of heavy crops of fodder for conserving as hay or silage, and the dry conditions which prevailed throughout the greater part of the summer and autumn have rendered it necessary to make inroads into the fodder reserves in order to carry stock over the lean period. It was for this reason that the competitions it had been intended to conduct at Young and Cootamundra were withdrawn, and also, no doubt, why some other societies were unable to arrange a competition.

Local competitions were conducted by four agricultural societies, viz., Cowra, Grenfell, Gundagai, and Tumut, and the first-prize winners in these district competitions were judged for the championship on 29th and 30th April.

The conditions and scale of points for judging the competitions were as follows:—

Fodders Eligible for Competitions to be—Concentrates (including all grains), roughage—as hay (*e.g.*, lucerne, oaten, wheaten, barley, clover, grass), silage, and any other fodder suitable for conservation, to have been produced on the land, owned, leased, or held on shares by the competitor. Fodder conserved over a period of more than four years not eligible.

SCALE OF POINTS FOR JUDGING.

		Points.
1. *Suitability and Quality of Fodder*		60
(*a*) Judged according to the suitability of fodder or combination of fodder for the purposes for which they are required ...	25	
(*b*) Judged as to appearance, apparent palatability, and nutritive and feeding values	35	
2. *Location and Protection*	...	45
(*a*) Locality—Location of the site, having regard to fire, flood, economy in feeding, and general access	10	
(*b*) Protection from weather, pests, stock, fire, and general deterioration	35	
3. *Economy of Production* ... ... Including land value, production, storage and feeding costs.	...	15
4. *Carrying Capacity*	...	60
Quantity for the requirements of competitor's holding to be based on the sheep-carrying capacity of the holding (when improved and under natural pasture.) The maximum amount considered to be competitor's requirements per sheep to be 5 cwt. lucerne hay or its equivalent in feeding value (1 cwt. lucerne hay = $1\frac{1}{2}$ cwt. cereal hay = 3 cwt. silage = 4 cwt. straw = $\frac{1}{2}$ cwt. grain)		
Total	...	180

TABLE of Awards, Central South-west Championship.

Order of Merit.	Society.	Competitor.	Suitability and quality of fodder. (a)	Suitability and quality of fodder. (b)	Location and Protection. (a)	Location and Protection. (b)	Economy of Production.	Carrying Capacity.	Total.
1	Cowra ...	W. A. O'Neil, Hillview, Cowra ...	20	25	8	31	13	28	125
2	Grenfell ...	Jas. Simpson, Weeroona, Grenfell	18	31	9	33	8	21	120
3	Gundagai ...	Jas. Robinson, Kimo, Gundagai..	23	30	8	32	8	9	110
4	Tumut ...	J. Kell, Riverview, Lacmalac ...	22	28	8	28	9	9	104

The fodder with which Mr. O'Neil won the championship was produced and stored on a property of 2,411 acres, of which 300 acres are sown with cereal crops, 230 acres with lucerne, 90 acres with Mulga oats for green winter fodder, and 50 acres with Subterranean clover; 200 acres are to be fallowed, and the balance of 1,541 acres is in pasture. The carrying capacity of the natural pasture was estimated at the rate of one and a quarter sheep per acre.

The conserved fodders consisted of four pits of oaten silage, two pits of wheaten silage, and one pit of lucerne silage, making a total of 756 tons of silage; also three stacks of oaten hay, of which two were harvested in 1926 and one in 1928, and one stack of wheaten hay, totalling 80 tons of cereal hay. In addition there were two stacks of lucerne mixed with grass, estimated at 15 tons; and 11 tons of oat grain stored in bulk in a barn, 100 bags wheat, and thirty bags of barley. The quality of the silage generally was only fair, there being too much waste resulting from mould in the upper layers. It is difficult definitely to ascribe a reason for this, but judging from the great amount of settlement that had occurred since the pit was covered it would appear that insufficient pressure had been applied during filling, and, possibly, cracks had formed in the earth covering as the result of the settlement, permitting the entrance of air and water. With the exception of the two stacks of 1926 oaten hay, which were damaged as the result of the ravages of mice, the haystacks were of very good quality.

There was a good variety of fodder, but a higher proportion of lucerne hay was required in order to provide for a balanced ration. The full quantity of fodder was calculated to be sufficient for feeding the stock equal to the carrying capacity of the property if under natural pasture for a period of nearly four and a half months, which is half the stipulated period for the purpose of the competition.

It was regarded that the fodder had been stored more economically than that of any other exhibit inspected this season, and it was situated at convenient points on the property, and generally was well protected from deterioration by weather and stock, but the cereal hay was exposed to damage by rodents.

The methods of conservation adopted by the winner of the second prize, Mr. Simpson, were quite a contrast, for he had concentrated on wheaten chaff, of which he had 430 tons stored in bulk in two large sheds especially constructed for the purpose.

As a rule, cereal chaff is considered to be an expensive form of conserved fodder, but Mr. Simpson cuts the costs down to a minimum by carting the hay direct from the stooks to the cutter, and then chaffing and blowing the chaff straight into the shed in one operation. When stored in bulk it is economical of space and practically immune from damage by mice. However, when the cost of production of the chaff is coupled with the cost of feeding it out, it cannot be regarded as a very economical method of conservation. The quality of the chaff was very good, and it was adequately protected in two closed-in galvanised-iron sheds. The fodder was sufficient in quantity for the feeding of the sheep that the property was capable of carrying for a period of a little more than three months.

The area of the property is 2,600 acres, of which 1,330 acres are pasture, 770 acres were sown to wheat last year, and 500 acres were fallowed.

The conserved fodder of the third-prize winner, Mr. Jas. Robinson, consisted chiefly of baled hay—of which 199 tons were lucerne, 23 tons oaten, and 14 tons wheaten hay—all securely stacked in two hay sheds, together with 35 tons of maize and 12 tons of wheat grain. The quality of the fodder was very good, but it was quite inadequate in quantity for the feeding of the stock carried on the property (5,200 acres) for the stipulated period. Of this area, 4,450 acres were pasture, 400 acres were under lucerne, 250 acres had been devoted to maize, and 100 acres were fallowed in preparation for sowing lucerne.

General Comments.

As might be expected in the initial competition in this division, there was room for improvement in some directions. The chief defect was that in no case was nearly sufficient fodder conserved for the maintenance of the competitor's stock over a period of severe drought. The districts represented are situated in a well-favoured portion of the State as regards seasons; still, droughts will inevitably occur sooner or later, and it is well to be prepared, for the incidence and duration of dry spells cannot be forecasted. In this respect, our stockowners are in a different position to those of North America, who know full well that they can expect a period of scarcity every winter, and are consequently obliged to conserve sufficient fodder for the hand-feeding of their stock for about five months every year.

Generally, throughout the Central South-west Division very little attention is given to the conservation of fodder in the form of silage, and it is therefore not surprising to find that only one competitor in the championship adopted this method. The value of silage as a drought reserve cannot be over-estimated; its succulent and laxative properties render it very suitable for the feeding of stock during dry periods, and, furthermore,

it can be conserved more cheaply and safely than in any other form. It is secure from damage by weather and the ravages of mice and other pests, there are no overhead expenses such as insurance, for it is not inflammable like hay, and, moreover, it is possible to ensile crops that are not very suitable for hay, and at times when weather conditions are not favourable for hay-making. Another point in its favour is that it is difficult to sell silage, and one is therefore not tempted to dispose of it at the risk of regretting it later.

The two main factors essential to success in making silage are the right condition of the fodder and the exclusion of air. To ensure the latter the fodder should be packed closely when the pit is being filled, and if the loaded waggons are drawn over the fodder when the pit is filled to near ground-level, it will greatly assist in compressing the fodder. If this is attended to, the time necessary for the settlement of the fodder is reduced and the pit can be covered with earth before the top layers of fodder have dried out.

Cowra and Grenfell Competitions.

W. D. KERLE, H.D.A., Senior Agricultural Instructor.

The Cowra and Grenfell P., A., and H. Associations showed the way to the rest of the societies in the central-western district this year by being the first to enter the field of fodder conservation competitions. Their initial efforts were very successful, as evidenced by their positions in the final judging for the R.A.S. championship of the Central South-west Division of the State.

The scale of points adopted for the judging of these competitions has been compiled with due regard to the whole subject of fodder conservation and feeding in drought times, and the quantity of fodder regarded as necessary for each sheep allows for nine months' feeding. While this is necessary in a large proportion of the State, it is not necessary to conserve such large quantities in the central-western district, and particularly in the two districts where the competitions were conducted this year, viz., Cowra and Grenfell.

The fodder conserved was of excellent quality, fairly well protected and economically produced, but in all cases much less in quantity than the amount required, although in most cases sufficient to feed the stock carried over a normal drought period. In these districts droughts are usually far apart, and it is possible to have fodder such as silage in the pits for some years before the necessity for utilising it arises. The only entrant in the Grenfell competition with silage (Mr. C. A. Carter) had put down 450 tons from 1915 to 1918 and an additional 300 tons in 1923, and had not had occasion to open the pits since. He was not able to include this fodder

in the competition, it having been conserved for more than four years. This is a handicap for central-western competitors.

The twelve months prior to the judging in March was not a satisfactory period for building up fodder reserves other than grain. Dry weather was experienced throughout the spring and summer, and the growth of green-stuff was very light. The grain harvest was very good, and oats in particular yielded well, and not being in great demand provided an excellent opportunity for bin storage. While the hay yields were light, harvesting weather was ideal and the quality of the hay produced was excellent.

The Cowra Competition.

Five competitors entered this competition, and the following awards were made:—

Awards in Cowra Fodder Conservation Competition.*

Competitor.	Suitability and Quality. a	Suitability and Quality. b	Location and Protection. a	Location and Protection. b	Economy of production	Carrying capacity.	Total.
W. A. O'Neil, Hillview, Cowra	21	24	8	25	10	32	120
C. Squire, Bumbaldry, Cowra	19	31	9	30	11	19	119
L. Twigg, Mayfield, Cowra	22	20	6	19	8	43	118
J. Davidson, Moroonbin, Merriganowery	17	23	8	24	10	23	105
E. J. Bourke, Pack's Grant, Cowra ...	17	24	8	22	11	15	97

* The scale of points is given on page 549.

The details of competitors' holdings and fodders conserved were as follows:—

Mr. W. A. O'Neil.—This competitor carried off both the local prize and the central south-west championship, and particulars of his entry are given in the judge's report of the championship.

Mr. C. Squire.—The area of the property is 2,210 acres, 90 acres of which were under lucerne and 400 acres under fallow. The stock carried were 2,931 sheep, 41 head of cattle, and 11 horses. The fodder reserves were 500 tons silage, 85 tons hay, and 7 tons grain, whereas the required amount for the normal carrying capacity would be 780 tons silage, 390 tons hay, and 73 tons grain. The reserves were therefore very much below requirements and sufficient for about three months only.

Under all other headings Mr. Squire scored particularly well. The silage pits were exceptionally good; they were of good size, well located, fenced off, well crowned and surface drained. The silage was made of lucerne and was of prime quality.

The wheat stacks were well located, well built, properly thatched and protected from big stock by a fence. The quality was excellent.

The grain was stored in galvanised-iron bins, and the chaff in mouse-proof sheds.

Mr. L. Twigg.—This entry included two holdings, viz., Mayfield, of 2,038 acres, and The Gem, a lucerne farm of 440 acres worked in conjunction with it. The total area of 2,478 acres had 370 acres under lucerne and 500 acres under fallow. Last season 500 acres were under wheat and 200 acres under oats. The stock carried were 3,280 sheep, 110 head of cattle, and 65 horses. The fodder reserves were 400 tons silage, 135 tons hay, 1,500 tons straw, 1,500 bags oats, and 800 bags wheat.

Mr. Twigg had sufficient grain and hay for the requirements necessary, but was short in silage. His total of reserves was, however, in excess of other competitors. A considerable number of points were lost under the other headings due to want of protection for the stacks, absence of crown on silage pits, high production costs, and poor quality of much of the fodder. The grain, which was of excellent quality, was stored in galvanised-iron tanks scattered around the paddocks.

The silage was of lucerne; one pit only was of good quality.

The straw stacks were not properly built, were unprotected from weather or stock, and placed indiscriminately in the paddocks.

Mr. J. Davidson.—This property is on the bank of the Lachlan and comprises 1,300 acres, of which 350 acres were under lucerne. Last season 150 acres of wheat, 50 acres of oats, and 20 acres of Sudan grass were sown. The stock carried at the time of judging were 1,600 sheep, 200 head of cattle, and 23 horses. The fodder reserves were 120 tons baled lucerne hay, 10 tons baled wheaten hay, 8 tons baled oaten hay, and 8 tons baled Sudan grass hay. The grain reserves were 240 bushels, chiefly oats. The quantity of fodder was very much less than required to feed the stock for the stipulated period. With anything like drought conditions approaching, the stock would be reduced by more than half.

The hay was all baled and in sheds; this is the only economical way to conserve hay. It was placed on the ground; if put on a 3-foot straddle, better protection would have been secured.

Mr. E. J. Bourke.—The area of this holding is 1,150 acres, 800 acres of which are cleared, 60 acres were under lucerne, and a further 70 under fallow for lucerne, 40 acres were under other crop last year. The stock carried at the time of judging were 2,200 Border Leicesters, 100 milking shorthorns, and 9 horses. Although mostly under natural pasture, Mr. Bourke considers his carrying capacity at two and a half sheep per acre comfortably. The stored fodders were 100 tons prime lucerne hay in stacks, and 25 tons second-grade hay in stacks. The stacks were very well made and protected from stock.

Mr. Bourke is dairying and finds the above reserves ample for his requirements. From the point of view of this competition they were very much below requirements.

The Grenfell Competition.

The points awarded in this competition were as follows:—

AWARDS in Grenfell Fodder Conservation Competition.

Competitor.	Suitability and Quality. a	Suitability and Quality. b	Location and Protection. a	Location and Protection. b	Economy of production.	Carrying capacity.	Total.
Jas. Simpson, Weroona, Grenfell ...	16	31	7	30	13	14½	111½
C. A. Carter, Kikiamah, Grenfell ...	18	30	8	22	10	9	97
O. G. Blayney, Baroola, Grenfell ...	18	30	6	18	10	15	97
S. Priddle, Birangan, Grenfell	14	28	7	28	10	5	92
R. C. B. Priddle, Old Glenelg, Grenfell...	13	23	6	20	8½	4½	75

The fodders conserved and details of the competitors' holding are as follows:—

Mr. Jas. Simpson.—This entry not only secured the district honours, but was awarded second place in the championship, and readers are referred to that report for particulars concerning Mr. Simpson's fodder reserves, &c.

Mr. C. A. Carter.—Kikiamah consists of 4,252 acres of level red loam soil. Last season 770 acres were under wheat, 60 acres under oats, and a small area only under lucerne; 600 acres were under fallow for the coming wheat crop. The stock carried was 4,000 sheep, 80 head of cattle, and 50 horses—equivalent to 4,780 sheep. The conserved fodders were 120 tons wheaten hay, 55 tons oaten hay, and 32 tons grain (chiefly oats). This is considerably below requirements. Mr. Carter had 750 tons silage which was not eligible, having been down more than four years. This was unfortunate, as it would have very considerably improved his points for carrying capacity.

The oats were conserved in tanks—the most economical form of storage. Specially constructed bins for storage of grain are a sound investment.

The haystacks were not thatched or protected from the weather, but were conveniently placed.

Mr. O. G. Blayney.—The area of Baroola is 2,390 acres. Last season 710 acres of wheat were harvested, and 70 acres of oats. At judging 750 acres were under fallow, and the stock on the property were 1,600 sheep, 30 horses, and 20 head of cattle—equivalent to 1,900 sheep. As the normal carrying capacity is quite a sheep to the acre, the requirements were based on that.

The fodder reserves were 80 tons wheaten hay, 20 tons oaten hay, 8 tons lucerne hay, 160 bags oats in tanks, and 440 bags in a shed, 60 bags of wheat in a shed.

The hay was of excellent quality and in a large shed, but was otherwise unprotected. The grain in bags was not in a mouse-proof shed, and storage bins would be an economical investment. The location of the hay and grain sheds, &c., was a dangerous one in case of fire.

The fodders conserved were considerably short of requirements, although Mr. Blayney secured highest point in carrying capacity.

Mr. S. Priddle.—Birangan is 5,000 acres in area. Last year 530 acres were under crop, and at the time of judging 280 acres were fallowed and 80 acres under lucerne. The stock consisted of 3,200 sheep, 100 head of cattle, and 20 horses. The fodders conserved were 140 bags grain (of which 100 bags were oats in a bin) and 70 tons of prime oaten hay, in a new shed, on a straddle and mouse-proof. The hay was not baled—an added insurance against vermin and in a more economical form to handle.

Mr. Priddle regards as his best reserves 1,000 kurrajong and about double that number of she-oak trees. These were not planted by him. The actual fodder reserves were considerably below the standard required.

Mr. R. C. B. Priddle.—The area of Old Glenelg is 4,000 acres, of which 154 acres are under grazing lucerne. Last year 462 were under crop, and 400 acres were fallowed at the time of judging. The stock carried was 5,000 sheep and 201 big stock. The fodders stored were very little in comparison to standard requirements, and consisted of wheaten and oaten hay of varying quality totalling 130 tons, 120 bushels of oats, and 360 bushels of wheat. A small quantity of the hay was baled, but otherwise not protected. The grain was in bags in a shed unprotected from rats and mice, except for a small quantity of oats in bin.

Actually the quantity of fodder on hand was sufficient for 456 sheep for the nine-month period. The sheep-equivalent was 6,206, hence the reserves would not have gone very far if hand-feeding had become necessary.

General Remarks.

This being the first fodder conservation competition conducted by the societies of Cowra and Grenfell, competitors were somewhat in the dark regarding the standards required, and particularly as to the quantity of fodder on hand in relation to carrying capacity. The general consensus of opinion in these districts, which can without doubt be regarded as among the safest in the State, is that the reserve of fodder required is unnecessarily high, as droughts of nine months duration are not experienced in these districts. Fodder in excess of requirements is, however, a wonderful insurance, and if conserved when feed is abundant and grain is cheap, must prove a profitable investment. Much depends upon the methods of storage and it is along these lines that these competitions will prove of very great benefit. It is obvious that the methods at present adopted can be vastly improved.

The kinds of fodder and the methods found to be the most economical for their conservation can be briefly summarised as follows:—

(1) *Grain.*—Oats and wheat in specially constructed and conveniently situated bins.

(2) *Silage.*—In pits of about 100 tons capacity; made of any nutritious, succulent, green material, cut at the right stage, pitted correctly, and topped off and drained properly.

(3) *Hay.*—Preferably baled and placed in weather-proof sheds on 3-feet straddles; or, if stacked, properly thatched, protected by galvanised-iron against mice, &c., and securely fenced against stock damage.

Gundagai and Tumut Competitions.

E. S. CLAYTON, H.D.A., Senior Experimentalist.

On account of the extremely dry summer experienced prior to judging, reserves of fodder were at a low ebb at both these centres. The class of material conserved was, in most cases, very suitable to the purpose for which it was intended (dairying at Tumut and feeding to sheep at Gundagai). Lucerne figured prominently at both centres.

At Tumut, Mr. James Kell, who has a small holding (75 acres), which is capable of carrying forty cows, secured first place. He had sufficient fodder to carry his stock for the full period, and the quality was quite satisfactory. It consisted of a total of 63 tons of hay, comprising 7 tons of lucerne hay, 8 tons of Red clover hay, 40 tons of a mixture of Red clover and lucerne hay, and 8 tons of oaten hay. In addition, Mr. Kell is well situated as regards grazing lucerne, having five small paddocks for this purpose: the cows are allowed access for one hour daily, and the paddocks are thus systematically grazed and rested.

The feeding of conserved fodder in winter and the improvement of pastures have rendered dairying much more profitable for this competitor. Whereas formerly his slack period occurred in winter, now his cows are milked through the autumn, winter, and spring, and the slack period falls in the summer. Cream is dearer in winter, and by adopting this method the dairying season has been lengthened and rendered more profitable.

At Gundagai, Mr. J. Robinson gained first place; his property, Kimo, is 5,200 acres in area, and the carrying capacity is roughly 1½ sheep to the acre. At the time of judging, 8,000 sheep, 400 head of cattle, and 60 horses were carried. The stored fodder consisted of 190 tons of lucerne hay, 60 tons of cereal hay, 600 bushels of wheat, 1,600 bushels of maize, and 120 bags of oats. As only fodder that had been conserved within the last four years was considered when allotting points, some 450 tons of lucerne hay had to be excluded from the competition. Mr. Robinson has a number of well-protected haysheds, one of which has been rendered mouse-proof by enclosing it with galvanised-iron. Practically all of the lucerne hay had been baled, and was thus in a more convenient form for feeding out or for transport. In addition to the fodder mentioned, there are 600 kurrajong trees on the property. Although no points were awarded for these, they are worthy of mention. It would be difficult to estimate the true value of these fodder trees, which offer an excellent drought insurance. As a fodder tree, the kurrajong is unsurpassed, and it is surprising that no general effort has been made in Australia to plant out new areas of these fine trees. The trees that grow naturally are generally valued and protected, but the planting of new areas of kurrajongs suggests itself as an effective means of alleviating drought.

THE R.A.S. MIDDLE WEST CHAMPIONSHIP.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.

In the middle west division five agricultural societies, viz., Dubbo, Narromine, Parkes, Trundle, and Wellington, organised district fodder conservation competitions this year, as compared with only one society last year and three in 1927. This increase in the number of competitions is all the more gratifying when the unfavourable nature of the season for producing fodder is taken into consideration. Improvement is not only confined to the number of entries, but, what is even of more importance, the general standard of the exhibits was much higher than in previous years. It is quite evident that competitors have benefited considerably by the publicity that has been given to methods of conservation in previous competitions.

More attention has been given to the storage of sufficient suitable fodder of good quality to carry stock over a period of severe drought, and to the adoption of adequate precautions for the protection of these reserves from deterioration. Some competitors have gone to no small expense to construct mouse-proof barns and haysheds, and this can be regarded as wise expenditure, which will return handsome interest on capital outlay by preventing the depreciation of a valuable asset. There is also evidence that the example of successful competitors in competitions of previous years is influencing their neighbours to "go and do likewise," and during the present dry spell many are now reaping the reward of their providence.

The conditions and scale of points for judging were similar to those adopted in the central south-west division (see page 549), and differs from that used in the previous year in that the heading "Quantity of Fodder in Excess of Requirements" has been eliminated, reducing the total possible points to 180. Judging, which was commenced at Parkes on 1st May, and completed at Wellington on 3rd May, resulted as follows:—

TABLE of Awards, Middle West Championship.

Society.	Name and Address.	Suitability.	Quality.	Location.	Protection.	Economy of Production.	Carrying Capacity.	Total.
	Maximum points	25	35	10	35	15	60	180
1. Parkes ...	E. J. Johnson, Iona, Gunningbland	21	32	9	33	10	60	165
2. Dubbo ...	Cullen Bros., Bunglegumbie, Dubbo	23	30	7	31	8	60	159
3. Trundle ...	K. Gault, Lynwood, Trundle ...	21	30	9	32	11	54	157
4. Narromine ...	G. Tomkins, Whittington, Narromine.	20	26	9	32	12	57	156
5. Wellington ...	J. M. Whitely, Glenroy, Geurie ...	22	29	8	29	11	35	132

Mr. E. J. Johnson repeated his success of two years ago by winning the championship with an exhibit that was outstanding as regards the quality of the fodder and the efficiency of protection. His property is 878 acres in

area, of which 350 acres were cropped with cereals last season—180 acres with oats as a fodder crop, 20 acres are sown with lucerne, 128 acres are in pasture, and 200 acres are fallowed.

The stored fodders comprised 160 tons of prime oaten hay, which had been baled and stacked in a large shed made mouse-proof by surrounding it with plain galvanised iron placed about 10 inches in the ground and 3½ feet above ground, and precautions had been taken to cap the joints between the sheets of iron in order to prevent mice from climbing the fence. Another shed, also rendered mouse-proof with galvanised iron 4 feet above ground and set in concrete, was two-thirds filled with oaten hay and one-third with wheaten hay, bringing the total cereal hay to 229 tons. A galvanised-iron oat silo of 3,000 bushels capacity, constructed of 18-gauge iron on a concrete foundation, was not quite full, containing 48 tons of oats grain. In two well-crowned pits 134 tons of oaten silage was conserved, which was in excellent condition right to the top, with practically no waste.

The quantity of fodder is sufficient for the feeding for nine months of 1,180 sheep, which is considerably more than the estimated carrying capacity of the holding. The protection given to the fodder was ideal, and the location was very satisfactory. The directions in which improvement could be made is by increasing the proportion of silage, and by including lucerne hay to enable a balanced ration to be provided. As Mr. Johnson now has 20 acres under lucerne, he will no doubt be able to remedy this defect, provided the season is favourable.

Mr. Johnson has provided an excellent demonstration of intelligent management of a mixed farm. Even though his property is devoted mainly to wheat, and there are only 128 acres of pastures, he was carrying at the time of judging 670 sheep, chiefly ewes for the production of fat lambs, and thirteen head of large stock (equivalent to about seventy-eight sheep). With the addition of lambs in a few months time, the sheep carried for the year will easily average one head per acre. This fine record is achieved by the cultivation of fodder crops for grazing, backed by the security of the large fodder reserves.

Messrs. Cullen Bros.—This is the third year in succession that Messrs. Cullen Bros. have been successful in winning the competition at Dubbo, and this year they also gained the honor of being runners-up in the championship.

Their property, Bunglegumbie, is situated on the Macquarie River, and has advantage of the river flats for the production of lucerne hay. The total area is 1,070 acres, of which 400 acres were sown with cereal crops last year, 70 acres were under lucerne, 200 acres were fallowed, and the balance of 400 acres were pasture.

The conserved fodders consisted chiefly of lucerne hay, of which there were 179 tons; in addition there were 107 tons of cereal hay, 20 tons of straw and 79 tons of wheat grain, and 5 tons of oats. The quality of the fodder varied from fair to prime, and was well protected from deterioration, all lucerne stacks being well built on dunnage of pine timber and well thatched, and

were also securely fenced against stock. The cereal hay was stacked in two sheds which were surrounded by a mouse-proof fence of galvanised iron, and the grain was stored in a mouse-proof galvanised-iron shed, which had a concrete floor 4 inches thick, with a skirting of 15 inches into which the iron walls were sunk 6 inches. The total quantity of fodder was sufficient for feeding 1,693 sheep during a severe drought, which is 355 more sheep than the estimated carrying capacity. While the absence of silage was a disadvantage, still, there was ample lucerne hay for the provision of a balanced ration.

Mr. K. Gault.—The third prize was won by Mr. Gault, who scored only two points less than the second-prize winner. Included in his fodder reserves were six small round stacks of cereal hay, which were well built on dunnage and each protected from mice by a surround of galvanised iron, and also securely fenced against stock and safeguarded against fire. The total weight of cereal hay was 90 tons, and there was an equal tonnage of silage in a pit which was well crowned and provided with drains for carrying away rain-water, but the top few inches of silage was mouldy. One galvanised-iron silo contained 13 tons of oats grain, and another contained 8 tons of wheat. The carrying capacity of the property was assessed at 580 sheep, and the quantity of conserved fodder was sufficient for the feeding of 528 sheep for the stipulated period.

Mr. G. Tomkins.—Special mention must be made of the excellent effort of Mr. Tomkins, of Narromine, who was unfortunate to miss gaining an award by the narrow margin of one point. His cultivation is practised solely for the purpose of producing fodder for conservation; he has had previous experience of selling produce and later being obliged to purchase and cart it at a much higher price. As "once bitten, twice shy," he has resolved not to be caught in the same way again. He now has large reserves, composed chiefly of silage and cereal hay, but unfortunately there was excessive waste due to mould in the top layers of the silage.

General Remarks.

The examples in fodder conservation set by the competitors in this competition, especially by Mr. E. J. Johnson, are well worthy of emulation by farmers throughout the wheat belt. The crop that has proved the most useful for the production of fodder in these districts is oats, which may be conserved in the form of silage, hay, or grain. The early-maturing varieties that are now available permit the claim being made that oats can be grown successfully wherever wheat is grown. The practice that is recommended, and which is followed by some progressive farmers, is to sow an early-maturing variety of oats early in the sowing period for the production of early green fodder for grazing with lambing ewes and for the production of fat lambs. These crops are grazed until July and August, and then allowed to produce a crop of hay the quality of which is ideal for sheep feeding. The straw is fine and short, with a large proportion of well-matured grain to straw. There is a saying that "you cannot eat your cake and have it," but this practice is a near approach to proving it a fallacy.

As experience in fodder conservation progresses more consideration should be given to the provision of a balanced ration. While cereal hay and cereal silage are excellent for providing a quantity of fodder, still, it must be realised that they are deficient in protein, and require to be supplemented with a high protein fodder in order to provide a balanced ration. Oats grain is of a satisfactory nutritive ratio for feeding alone, but is not sufficiently rich in protein to materially improve the feeding value of cereal hay and silage. The fodder most suitable for the purpose is lucerne hay, which possesses a high protein content, and as it is much more economical to feed a balanced ration than one which is deficient in protein, more attention should be given to the production of lucerne hay.

While river flats are most suitable for the production of high yields of lucerne, still they are not essential for the growth of the crop. Lucerne is a fairly adaptable crop, and with proper preparation of the soil can be grown successfully on a variety of soils in the districts represented in this competition, but best results will be achieved if the lower portions of the farm (provided they are well drained) are selected for the purpose.

The development of mould for several inches in the top layers of some of the pitted silage was apparently the result of the surface fodder drying out before covering with earth. In these western districts, where the rate of evaporation is high, there should be no undue delay in covering, as this permits the fodder to dry out; or, if the fodder should have become dry, the remedy is to add another layer of green fodder or to sprinkle with water before covering, with the deliberate object of encouraging a prolific development of mould on the immediate surface of the silage, which has been proved to be an effective seal against the entrance of air, thus preserving the silage below. If the surface fodder is dry, however, the air will penetrate several inches into the fodder, with the result that mould gradually develops and the silage in the upper layers in spoilt.

Parkes and Trundle Competitions.

H. BARTLETT, H.D.A., Senior Agricultural Instructor.

In this portion of the central west, two associations conducted competitions, viz., Parkes with three entries and Trundle with five entries. These competitions were judged according to the same scale of points as set out in the report of the championship.

The Parkes Competition.

First place in the Parkes competition was awarded to Mr. E. J. Johnson, of Iona, Wongalea. Mr. Johnson won the local competition and championship in 1927, and repeated the performance this year. Particulars of his entry are given in the judge's report of the Middle West Championship.

Mr. A. P. Unger, of Stony Hill, Alectown, was second. The area of his property is 1,600 acres, of which 150 acres are to be sown to wheat, 100 acres to oats, 25 acres to lucerne, and 170 acres will be fallowed, leaving

a purely grazing area of 1,155 acres. The carrying capacity of the property is one sheep to the acre and the stock actually carried numbers 1,700 sheep, twenty horses, and four head of cattle. For the purposes of the competition, Mr. Unger entered 294 tons of cereal hay and 49 tons of grain. To comply with the conditions, 350 tons of silage conserved prior to 1925 were not eligible.

A special feature on this property was a group of three excellently constructed grain silos.

Mr. G. Tanswell, Glenara, Coradgery, occupied third position, but the quantity fell rather short of the competition requirements, although the quality of that shown was well up to standard.

AWARD Table, Parkes Competition.

Competitor.	Suitability and Quality.		Location and Protection		Economy of production	Carrying capacity.	Total.
	a	*b*	*a*	*b*			
Maximum Points...	25	35	10	35	15	60	180
1. E. J. Johnson, Iona, Wongalea ...	22	32	9	30	13	60	166
2. A. P. Unger, Stony Hill, Alectown ...	16	31	7	23	14	45	136
3 G. Tanswell, Glenara, Coradgery ...	15	32	8	23	13	26	117

The Trundle Competition.

There were five entries in the Trundle competition, first place being awarded to Mr. K. Gault, Lynwood, whose property has an area of 1,169 acres, of which 600 acres are sown to cereals, 230 acres are to be fallowed, leaving 331 acres as a purely grazing area for the coming year.

The carrying capacity is based on one sheep to 2 acres, but the number of stock actually carried is 500 sheep, fourteen horses, and five head of cattle. The fodder conserved consists of 80 tons of silage, 90 tons of cereal hay and 21 tons of grain.

The location and protection of this fodder very nearly approaches the ideal. The site is centrally situated, convenient to feeding paddocks and water, and most convenient for distribution. The haystack yard is rather unique; an area securely fenced and well protected by fire breaks is marked into ten haystack sites with centres 1 chain and 1½ chains distant. These sites are permanent and each is protected from mice by a galvanised-iron fence, and has a wooden base. The grain is stored in two galvanised-iron silos, and the silage pit has been well filled and covered, and protected by drains.

Mr. S. Bloomfield, of Ravenswood, filled second place. With an area of 1,232 acres, 450 acres are cropped and 450 acres fallowed, leaving a pasture area of 332 acres. The carrying capacity is one sheep to 2 acres, and the stock carried is 600 sheep, fourteen horses, and six head of cattle.

The fodder conserved is 117 tons of silage, 88 tons of cereal hay, and 54 tons of grain in the form of wheat, oats, and barley, the whole being the equivalent of 201 tons of lucerne hay. The amount required for competition purposes is the equivalent of 154 tons of lucerne hay, so Mr. Bloomfield scores the maximum for carrying capacity, having more than sufficient for feeding over a period of nine months.

Messrs. George Simmons and Sons, of Grassdale, with an area of 4,480 acres, have conserved 170 tons of cereal hay and 48 tons of grain. The haystacks were exceptionally well built and are perhaps among the best in the whole district. Owing to the area of the property, many points were lost under the heading of carrying capacity. This entry secured third place.

Messrs. G. C. Little and Sons, of Darriwell, with a holding of 3,700 acres, conserved 560 tons of silage, 64 tons of cereal hay, and 15 tons of grain (wheat). Mr. Little is a strong advocate of fodder conservation, and he is enthusiastic in relating what these reserves have meant to him; not so much because of the actual feeding of the fodder, but because of the greater number of stock he has been prepared to carry, knowing that he runs no risk in the event of a dry spell.

Mr. H. Allez, of Daisy Field, exhibited 62 tons of prime hay and 9 tons of exceptionally good oats, which is really fit for seed purposes. The quantity was somewhat short of the requirements of the competition, and this and not the quality largely accounts for the lower award.

AWARD Table, Trundle Competition.

Competitor.	Suitability and Quality. a	Suitability and Quality. b	Location and Protection. a	Location and Protection. b	Economy of production	Carrying capacity.	Total.
Maximum Points...	25	35	10	35	15	60	180
1. K. Gault, Lynwood	21	32	10	33	14	53	163
2. S. Bloomfield, Ravenswood	24	31	9	24	13	60	161
3. Geo. Simmons & Sons, Grassdale ...	17	32	7	30	14	29	129
4. G. C. Little & Sons, Darriwell ...	15	32	8	24	13	34	126
5. H. Allez, Daisy Field...	17	33	8	28	13	17	116

Narromine, Dubbo, and Wellington Competitions.

B. M. ARTHUR, H.D.A., Senior Agricultural Instructor.

Three agricultural associations arranged for local competitions this year, viz., Narromine, Dubbo, and Wellington.

The entries were not numerous at any centre, but each competition undoubtedly served a useful purpose, and brought to light some outstanding efforts to conserve fodder along correct lines. In each district were

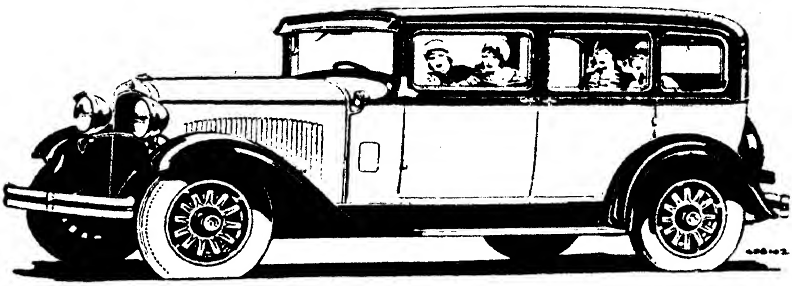
discovered landowners who, either as the result of past experiences or from the publicity given to the subject, have come to realise the wisdom of conserving fodder. Some of these have concentrated largely on silage, pitted mainly from self-sown crops of wheat and wild oats in the good year of 1926; others have stored cereal hay in derrick-pressed bales of suitable size; others have concentrated on the storage of large reserves of grain in bins, while those fortunate landowners with river frontages have been able to put by stacks of lucerne hay and first-cut lucerne silage.

Most of the competitors have realised the necessity for a mixture of fodders in order to supply a balanced ration, or suitable nutritive ratio, but the proportions may not always be correct. Generally speaking, protection of fodder from weather and pests has been attended to, although comparatively few competitors believe the expense of protecting haystacks against the possible attacks of mice or rabbits is warranted.

Fodder conservation as a sound method of ensuring maximum returns from grazing land must receive increasing recognition from landowners as time goes on and setbacks due to losses of stock are experienced. It is, of course, recognised that it costs money to conserve fodder and it represents capital lying idle, but even if not used for some years, the sense of security it affords during that period enables the landowner to stock his property up to its normal carrying capacity all the year round, with the full knowledge that he can carry on for a lengthy period by hand-feeding if the necessity arises. Therefore, fodder conservation is a sound form of insurance against drought, and the capital cost—the premium paid for that insurance—can be spread over a number of years.

Award Table, Narromine, Dubbo, and Wellington Competitions.

Society.	Competitor.	Suitability and quality of fodder. A.	Suitability and quality of fodder. B.	Location and protection. A.	Location and protection. B.	Economy of production.	Carrying capacity.	Total.
Narromine ...	Colin Tomkins, Whittington ...	22	31	8	32	12	60	165
	J. H. Drew, Little Farm ...	21	28	8	31	11	60	159
	Dave Jones, Beneta	17	26	8	26	13	60	150
	E. F. Warren, Eureka... ...	18	23	7	27	11	50	136
	McKillop and Sons, Buddah ...	22	30	6	30	12	20	120
Dubbo ...	Cullen Bros., Bunglegumbie ...	20	31	7	29	9	60	156
	H. Harvey, Kindalin	21	29	8	32	11	53	154
	C. A. Wright, Dulla Dulla ...	20	28	8	31	10	36	133
	D. N. Blackett, The Valley ...	17	26	8	28	11	17	107
	W. A. Strahorn, Eulandool ...	16	23	7	26	12	20	104
Wellington ...	J. M. Whitely, Glenroy ...	20	29	8	31	12	39	139
	Stevenson Bros., Terra Billa ...	22	32	8	31	13	26	132
	N. McLeod, Inverness... ...	18	27	8	30	10	31	124
	E. E. Martin, Bodangora ...	21	30	9	32	12	18	122
	D. McLeod, Lochaber... ...	16	25	7	27	11	28	114
	H. W. Johnston, Dickerton ...	17	24	8	29	9	14	101



The Narromine Competition.

The outstanding feature of the Narromine competition was the general all-round excellence of Mr. Tomkins's effort at fodder conservation. Over 300 tons of cereal hay, mostly oats grown last season, has been derrick-pressed and stored in a new shed with adequate protection from weather, mice, and stock. Over 600 tons silage has also been pitted, the great bulk of the material being from self-sown crops. In addition, grain and chaff have been suitably stored in bins and chaff shed. It is indeed a worthy effort in the right direction, and all stock carried could be well fed over a lengthy dry period, if the necessity should arise.

Mr. J. Drew has a large mixture of fodders, mostly silage, and is well provided for in case of drought.

Mr. Dave Jones was not slow to accept nature's gift of a prolific self-sown crop of wheat and wild oats in 1926, which he stored away in the form of silage (775 tons) and baled hay (270 tons).

Messrs. McKillop and Sons, of Buddah, a property of 13,800 acres on the Macquarie River, have done well to conserve over 1,000 tons of silage, baled cereal hay, and lucerne as security against the possibility of being overstocked during a dry time.

The Dubbo Competition.

In the Dubbo competition Messrs. Cullen Bros. again won for the third consecutive time. They are fortunate to be situated on the Macquarie River, thereby being in a position to grow and conserve lucerne, but their efforts in cereal hay and grain production are good, and particular attention has been paid by them to protection against damage by weather and stock. For greater detail regarding this entry, readers are referred to the report of the Middle West Championship.

Mr. H. Harvey has a well-balanced reserve of silage, hay, chaff, and grain, and is a great believer in being prepared for any contingency.

Mr. C. A. Wright is also on the Macquarie River and has made good use of its lucerne-growing potentialities, which crop he has conserved in large amounts in the form of both hay and silage.

The Wellington Competition.

This is Wellington's first entry into the field of fodder conservation competitions, and it has brought to light some worthy individual efforts.

Mr. Whitely, the winner, is a great believer in grain as a suitable means of feeding sheep and large stock during times of feed scarcity, and now has stored in bins over 4,000 bushels of oats and wheat, which were grown in 1928. These temporary bins in barns have removable sides, are easily filled, and the grain can be readily drawn off by means of chutes provided for that purpose.

Also during 1926, a self-sown crop of wild oats was cut for hay, and stacked in six stacks. This, together with 100 tons cereal hay grown in 1927 and 1928, constitutes an adequate supply of roughage to feed with the grain, thus providing a suitable balanced ration.

Messrs. Stevenson Bros., runners-up in this competition, are on the Macquarie River with a holding of 2,640 acres, and are making excellent use of this parcel of high-quality country. Nearly 300 acres are under lucerne, and approximately 5,500 head of stock are run on the property, off which many fat lambs are sold annually. Much of the fodder produced has been sold to others in need of it, but between 150 and 200 tons of baled lucerne hay, together with 400 tons silage, also cereal hay and grain, remain as a large fodder reserve if the occasion should arise to hand-feed.

That there are some progressive landowners in every district, who realise the necessity for conserving fodder in order to protect themselves against heavy losses in adverse seasons, is evidenced by the results of these competitions, which serve a very useful purpose in giving publicity to the methods of these progressive men, thus pointing the way for others to follow.

World's Orange Production on the Increase.

It it clear that all the principal orange-growing countries, notably Spain, the United States, South Africa and Palestine, have expanded their production enormously since the war, and seem likely to continue to do so in the next few years, states a survey of world production and trade in oranges issued by the Empire Marketing Board.

Production of oranges in Australia is steadily increasing, and, although at present only a small surplus is exported to the United Kingdom, in future a larger export trade appears probable, says the survey.

The United Kingdom is the world's largest importer of oranges, and takes one-third of all the oranges entering the channels of world trade. Spain supplies her with 67 per cent. of her total imports, followed by Palestine with 17 per cent., and South Africa and the United States each with 6 per cent. Although consumption has been steadily increasing since before the war, it is not certain that it will be able to keep pace with production unless the price to the consumer goes down. Further, increased competition will breed stricter grading standards, and consequently some use will have to be found for the culled fruit if orange culture is to continue to pay. Conversion into such by-products as fruit juice, soft drinks, marmalade juice, pulp, oil, and cattle food offers a hopeful solution.

At present only 9 per cent. of Great Britain's annual orange imports reach Covent Garden between May and November, and if consumption during this period could be stimulated it would meet the increased production expected in countries lying in the Southern Hemisphere.

The Value of Insectivorous Birds.

How to keep insect pests in check is a question of the greatest importance to the whole community, writes an expert of the Toronto Department of Agriculture. It can be done at little or no cost by intelligently encouraging and protecting our birds.

Lucerne as a Supplement to Paspalum Pastures at Wollongbar.

S. C. HODGSON, H.D.A., Experimentalist, Wollongbar Experiment Farm.

THE problem of balancing the ration provided for dairy cattle by the paspalum pasture in the Richmond and Tweed River districts is an important one. Except for a short period in the spring, when white clover usually appears and has the effect of balancing the ration, the nutritive ratio of paspalum pasture is somewhat too wide for milking cows.

A nitrogenous plant, such as lucerne or other legume, is required to render the ration more suited to dairy cattle in milk. Several legumes have been tried here for this purpose, and, of these, cowpeas and velvet beans have given good results and are eaten fairly readily by the cows once they have become

A Lucerne Stand More Than Three Years After Sowing.

This photograph was taken at Wollongbar in April, 1929.

accustomed to them. These plants provide about three grazings in the season, but, being annuals, too much time has to be spent in preparing the land and growing the crop compared with the amount of produce obtained from them. For this reason they are, economically, a doubtful proposition.

Lucerne, being a perennial legume and suited to grazing (though it lasts longer when mown instead of being grazed), is a very suitable crop for the

purpose if it can be grown. But it has often been claimed that lucerne cannot be grown here, partly on account of the soil conditions, but mainly, it is claimed, because paspalum will kill it out in a very short period. The question of unsuitability of soil is said to apply especially to the big scrub country, in which Wollongbar Experiment Farm is situated. The experience gained at this farm has shown that paspalum does encroach on the lucerne, but it can be kept reasonably well in check by mowing occasionally, provided the soil is well prepared and as free as possible from paspalum to commence with.

While the preparation for the growth of a perennial, and especially a fine-seeded perennial like lucerne, has to be more thorough than for an annual, this expense is offset by the fact that the preparation has only to be carried out once in several years, instead of every year as in the case of an annual. An acre of lucerne sown in March, 1926 (over three years ago) still

Another Stand More Than Three Years Old.
This photograph was taken at Wollongbar in April, 1909.

looks rather well, and there is every probability of its growing for another two years at least. This 1-acre paddock was mown in February, 1929, and provided rations for a herd of over fifty milkers for a fortnight, and, as will be judged from the photographs, taken in April, 1929, plenty of growth was made after the mowing mentioned above. The paddock has since been heavily stocked, and is, at the time of writing (May, 1929) grazed short.

It is intended to try a larger area at the farm in the future, and it would appear to be worth the while of farmers in the district to attempt to grow at least a small area of lucerne as a fodder crop.

Improvement of Grasses and Herbage Plants.

Breeding and Selection Work in New South Wales.

H. WENHOLZ, B.Sc. Agr., Director of Plant Breeding, and
J. N. WHITTET, H.D.A., Agrostologist.

With the establishment of the Plant Breeding Branch of the Department in 1927, arrangements were made at once to undertake some work in the improvement of the more important grasses and forage plants in New South Wales. Improvement work with those grasses and forage plants that are cultivated crops, such as lucerne, sorghums, Sudan grass, etc., in which some selection work had already been done by the Agrostologist, and work with leguminous forage crops, such as cowpeas, soybeans, velvet beans, field peas, vetches, etc., were taken over entirely by the Plant Breeding Branch, and it was decided that the improvement work with other grasses and herbage plants that do not come under the heading of cultivated crops should be proceeded with as a co-operative effort between the Plant Breeding Branch and the Agrostologist.

More than 90 per cent. of the total area of New South Wales is uncultivated, being given over to grasses and herbage plants which are of considerable importance to the pastoral industries of the State.

Main Grass Regions of New South Wales.

Rainfall and climate largely determine the character of the grassland regions in New South Wales, which, for the sake of convenience, may be grouped as follows:—

1. *Western Slopes and Plains* in which the most important herbage plants are of several types:—

(a) Perennial grasses which make their best growth during the more favourable winter months, and which provide some feed under favourable conditions during the warmer part of the year. The chief of these are the Wallaby grasses (*Danthonia* spp.) and Spear grasses (*Stipa* spp.).

(b) Perennial summer grasses which make their best growth during the hotter weather (depending, of course, on the rainfall), and which may be said to have a certain measure of drought resistance. The best of these are the Panic grasses (*Panicum* spp.), Blue grasses (*Andropogon* spp.), Love grasses (*Eragrostis* spp.), Rhodes grass (*Chloris gayana*), Mitchell grasses (*Astrebla* spp.), and the saltbushes (*Atriplex* spp.).

(c) Annual summer grasses, etc., e.g., Flinders grass (*Iseilema Mitchellii*) and slender-fruited saltbush (*Atriplex leptocarpum*).

(d) Annual winter grasses and herbage plants, which provide excellent forage during the period of winter rainfall, re-seeding naturally, many of which provide useful dry feed in the spring or summer, and some legumes, such as Burr medic, which provide concentrated feed in their seed or pods which remain on the ground. The most important of these in New South Wales are Wimmera Rye grass (*Lolium rigidum* var. *strictum*), Subterranean clover (*Trifolium subterraneum*), Barley grass (*Hordeum murinum*), native and introduced crowfoots (*Erodium cygnorum* and *E. cicutarium*), Cluster or Ball clover (*Trifolium glomeratum*), and Burr medic (*Medicago denticulata*).

2. *Tableland Districts*:—

(a) Perennial grasses and clovers, of which the chief are Toowoomba Canary grass (*Phalaris bulbosa*), Cocksfoot (*Dactylis glomerata*), Perennial Rye grass (*Lolium perenne*), Red clover (*Trifolium pratense* var. *perenne*).

(b) Annual clovers—Black medic (*Medicago lupulina*) and Subterranean clover (*Trifolium subterraneum*).

3. *Coastal Districts.*—Perennial grasses and clovers, chiefly Paspalum (*P. dilatatum*) and White clover (*Trifolium repens*), together with the perennial grasses and clovers mentioned for the tablelands.

Improvement Work in Western Grasses, etc.

Wallaby grasses.—The Danthonia or Wallaby grasses are among the most important perennial native winter grasses in the western districts. The most valuable species in New South Wales are *Danthonia semiannularis, D. racemosa,* and a third promising species (provisionally called *D. Duttoniana*). The Agrostologist has already made some selections of different types of these grasses, and they are being placed under further observation with a view to determining how far and by what means they lend themselves to further practical improvement. Unfortunately, the considerable seed trade which has developed in New Zealand in Danthonia seed is in the *Danthonia pilosa*, a species considered to be much inferior to the three above-mentioned species for New South Wales conditions. There is as yet no extensive seed trade in the more valuable species.

Panic grasses.—Native, perennial, summer-growing, drought-resistant grasses naturally found in pastures in the western districts. The chief of these are Coolah grass (*Panicum prolutum*), Native millet (*P. decompositum*), and Warrego summer grass (*P. flavidum*). Some selection of apparently superior types of these grasses has already been made by the Agrostologist.

Giant Panic grass (Panicum antidotale).—A promising drought-resistant native summer grass which does not occur spontaneously in pastures. This grass is under observation to determine whether any improvement can be effected by the selection of apparently superior types.

Texas Grass (Panicum bulbosum).—An introduced grass comparing very favourably with the native summer drought-resistant Panic grasses mentioned above.

Queensland Blue grass (Andropogon sericeus).—This native drought-resistant summer grass was at one time one of the chief pasture plants of the western districts, but has disappeared from many grazing areas through overstocking.

Weeping Love grass (Eragrostis curvula).—An introduced perennial summer grass which has proved to be very drought resistant. It does not occur spontaneously in pastures.

Rhodes grass (Chloris gayana).—An introduced perennial summer grass, fairly drought-resistant when once established. Some apparently good selections of this grass have already been made by the Agrostologist.

Curly Mitchell grass (Astrebla triticoides).—A native perennial summer grass particularly suitable for the Black Soil Plains and north-west districts of New South Wales.

Flinders grass (Iseilema Mitchellii).—An annual drought-resistant summer grass often found in close association with Mitchell grass.

Slender-fruited saltbush (Atriplex leptocarpum).—This annual saltbush is regarded as a better species in New South Wales than most of the perennial saltbushes. It seeds heavily, and provides more feed in dry districts than any of the perennials.

Wimmera Rye grass (Lolium rigidum *var.* strictum).—An annual species which has made rapid headway in the western districts of more favourable winter rainfall. Seed of this grass is already on the market, and attention is being given to its improvement by selection.

Subterranean clover (Trifolium subterraneum).—This clover is gaining ground rapidly in New South Wales, and there is already a well-developed seed trade in it. It is being subjected to selection for its possible improvement.

Barley grass (*Hordeum murinum*), the native and introduced crowfoots (*Erodium cygnorum* and *E. cicutarium*), Cluster or Ball clover (*Trifolium glomeratum*), and Burr medic (*Medicago denticulata*) are the best of the early annual winter herbage plants in New South Wales.

All of these with which actual selection work for their improvement has not yet been undertaken are under observation to determine whether there is any possibility of marked improvement by selection.

Coastal and Tableland Grasses and Clovers.

Toowoomba Canary grass (Phalaris bulbosa).—This is the best of the perennial winter grasses for the tablelands and coastal districts, and would appear to lend itself to improvement by breeding and selection, to which attention has already been given by the Agrostologist in the selection of some apparently superior herbage forms. The breeding of suitable types for the coast as well as for the tablelands has also been taken up.

Cocksfoot (Dactylis glomerata).—The Agrostologist has already selected some apparently superior strains of cocksfoot for tableland conditions, some of which are from strains developed at Aberystwyth (Wales). The methods of breeding adopted at Aberystwyth have been studied at first hand, and it has been deemed advisable that the breeding and selection of superior strains adapted to different conditions in New South Wales should proceed contemporaneously with the further introduction and testing of strains already developed for Aberystwyth and other conditions. The breeding of strains for such conditions in New South Wales is not considered to be duplicating the work at Aberystwyth. Co-operation between the Plant Breeding Branch and Agrostologist in this breeding work renders possible the use of the best technique allied with the necessary specialised knowledge.

Cocksfoot seed has already been introduced from many countries, and further introductions are being made from other countries hitherto unexploited.

Perennial Rye grass (Lolium perenne). *Perennial Red clover* (Trifolium pratense *var.* perenne), and *White clover* (Trifolium repens).—Similar work to that on cocksfoot is already under way.

Black medic (Medicago lupulina).—A possibly valuable annual forage plant for the tablelands.

Paspalum grass (Paspalum dilatatum).—This is by far the most important coastal grass in New South Wales. No previous attempt has been made in Australia to improve this grass by breeding or selection methods, although there is a well-developed paspalum seed trade, which offers distinct opportunities for making any improvement effected immediately of great practical value. It is not yet known whether this grass offers any possibilities of improvement by this means, but it is at present under close observation and investigation in this respect.

Some of the grasses and clovers mentioned have a well-developed seed trade in regular channels from outside Australia, and before any superior strains which might be evolved locally can be developed and distributed on a large scale in practical utilisation, means must be devised for an alteration in the existing seed trade channels. This may prove somewhat difficult of accomplishment.

In addition to the foregoing programme of work in grass and herbage improvement, the Plant Breeding Branch is making an attempt on some species crosses in certain grasses in which the Agrostologist has indicated the high desirability of combining characters possessed by each prospective parent.

Fallow Erosion.

THE LOSSES CAUSED AND MEANS OF PREVENTION.

W. D. KERLE, H.D.A., Senior Agricultural Instructor.*

ONE of the greatest problems confronting the wheat-grower on undulating country is the washing away or erosion of his fallow ground by heavy summer rains. It is frequently the case that the ideal fallow to-day is, with the advent of a heavy storm, a network of irregular gutters to-morrow. Moreover, a continuance of heavy storms may result in such huge gutters being made that it is impossible to fill them in. It is common in such country to see watercourses that had their origin in this way, and paddocks cut into many irregular shapes. The difficulties encountered in such paddocks in ploughing, sowing, harvesting, &c., are apparent, and the cultivation paddocks are often considerably reduced in area.

After continuous heavy summer rains, as in February, 1928, it is common to see fallow paddocks with extensive areas of subsoil showing through, the surface soil having been transported to lower levels and often into other paddocks, or to roadways, dams, &c. The amount of surface soil lost in this way is very considerable. In recent experiments conducted in the United States of America, it was shown that land with a fall of 2 feet in 100 feet lost 41 tons of surface soil per acre in six months with 25 inches of rain, and 7 tons per acre with 15 inches of rain for the same period. The same experiment also showed that the actual water lost in surface run off amounted to 44 and 26 per cent. of the total rainfall, respectively. These figures demonstrate the seriousness of soil erosion, and afford an indication of the extent to which loss of fertility may occur. Furthermore, it shows that an extraordinary amount of water is lost in surface run off, which, if only partially arrested, would result in a big increase in available moisture for the growing wheat crop.

It has frequently been remarked that the soil is nowadays more prone to washing than it used to be. A study of the rainfall statistics for the last twenty years does not show that there is any great difference in the incidence or severity of summer rain storms; it cannot, therefore, be due to a change in climatic conditions. There can be no doubt that one of the main contributing factors to soil erosion is forest denudation. The natural flow of water in forest soil in elevated country is below the surface, but when the timber has been destroyed the physical condition of the soil changes, and the surface water, unable to penetrate quickly, causes a surface run off resulting in serious channelling and erosion.

* Paper read at the South-western District Agricultural Bureau Conference at West Wyalong, 1929.

The Value of Judicious Cultivation.

While it is admitted that under torrential rainfall conditions it is impossible to prevent the washing away of fallow ground, there are undoubtedly causes that contribute to fallow erosion under less severe conditions, which can be prevented. Some wheat-growers are inclined to the opinion that working a fallow to keep it weed-free and to bring about the correct depth of mulch and degree of compactness of the sub-surface soil is conducive to fallow erosion. Their argument in support is usually that the neighbour who allowed summer grasses such as stink grass (*Eragrostis major*) to take possession of the fallow, suffered much less from the heavy storms owing to the binding action of the roots and the retarded flow of the surface water. A fallow in this condition undoubtedly will not wash to the same extent, but heavy summer rains do not happen very often, and a wheat-grower who allowed weed growth on his fallow to prevent soil erosion would soon be on the wrong side of the ledger.

It is considered, therefore, that any drastic alteration in the departmental recommendations regarding fallow working in undulating country is not advisable. Two modifications, however, are suggested, namely, (1) to leave the mulched surface considerably rougher than is usually recommended; (2) to compact the sub-surface as early as possible and not later than December. By the judicious use of the right implements and the correct handling of sheep, both these conditions can be more or less easily produced on the fallow. With regard to the former it is advisable not to use the harrows to such an extent that the surface soil is made very fine. Such a mulched surface, while the most effective of any in conserving soil moisture, is not advisable in undulating country, and some sacrificing of moisture is advisable to prevent erosion of the fallow, should heavy summer rains eventuate. It can be readily understood that a fallow which is deep, loose and fine on the surface presents an ideal set of conditions for erosion, and having the fallow in this condition in summer is courting disaster. In order to have the surface soil sufficiently compacted by early summer the first essential is to fallow early, *i.e.*, in June or July, when the normal rains and the use of cultivators, or sheep if necessary, will bring about the desired compactness.

Perhaps one of the most common sources of erosion and channelling of fallowed ground is ploughing round a paddock irrespective of its contour, and ploughing out or deeply cultivating the corners. These provide the foundation for very severe erosion and the creation of huge gutters. It is obvious that whenever possible, ploughing and working the implements across the natural flow of the water during the storm period is the only common-sense method to adopt. This will mean ploughing in lands, and particular attention should be paid to "finish outs." If ploughing round the paddock is adopted, and it usually is where tractors are employed, it is preferable to leave the corners unploughed if the slope is severe, rather than to plough them out deeply, or to cultivate them to a shallow depth.

The Effect of the Humus Content.

Under the dry-farming methods adopted by the wheat-growers of this State, the loss of organic matter in the soil is considerable, and is probably the greatest problem confronting the wheat-grower of the future. The fertility of a soil depends very largely on its organic matter or humus content, which affects the physical, chemical, and biological condition of the soil. The power of a soil to absorb and retain water depends very largely on the amount of humus present, and it can be readily understood how essential humus is in our wheat districts where the retention of moisture for the needs of the wheat plant is of paramount importance. It can be definitely asserted that the primary cause of soil erosion in our undulating wheat lands is this loss of organic matter, and while some modifications in cultural methods as suggested might assist in minimising the trouble temporarily, it can only be prevented ultimately by augmenting the supply of organic matter in the soil.

Rotation as a Means of Soil Improvement.

It will naturally be asked, "What is the best method to adopt to maintain or increase this organic matter in our wheat soils?" The answer is, "By systematic rotation of crops." Much has been said and written of late years regarding suitable rotations with wheat. It must be admitted, however, that it is somewhat difficult economically to fit in a suitable rotation without considerably reducing the area under wheat. Possibly the quickest method would be a rotation with a legume such as field peas as practised now in South Australia, and it is confidently expected that this crop will eventually prove economical in the more favoured portion of the wheat belt of this State. At the present time, the rotation which can most profitably be employed on the undulating wheat lands of the central-western districts is (1) wheat, (2) oats, and (3) fallow. Such a rotation, which would involve, for the economic utilisation of the oats, a considerable increase in the number of sheep carried, would assist materially in restoring the loss of organic matter in the soil.

A rotation of (1) wheat, (2) pasture, and (3) fallow, can be more profitably employed on some farms, or in localities not so suitable for oats, and will bring about a similar increase in humus, particularly if the natural growth of trefoil, clovers, &c., is stimulated by heavy applications of superphosphate to the wheat crop.

The value of lucerne as a soil renovator is well known, and it should be grown on the uplands of wheat farms in the central-west to a much greater extent than at present. In fact, where the slope is severe, and the soil particularly liable to washing, it would be more profitable to lay it down to grazing lucerne or pasture than to grow wheat.

It will be recognised, therefore, that the problem of soil erosion on our fallows is one that cannot be remedied in a day, but only by a gradual process of maintaining and increasing the organic matter within the soil, and the adoption of common-sense methods of tillage.

Field Experiments With Wheat.

Reports on the Season 1928–29.

Wagga Experiment Farm.

D. V. DUNLOP, H.D.A., Experimentalist.

The outstanding feature of the past season was the abnormally heavy rainfall experienced during the first three months of the year, 299 points falling in January, 722 in February, and 321 in March, a total of 13·42 inches. This resulted in the fallow being badly "washed" and necessitated a skim ploughing in February and another in March. Rain fell as follows between 1st April and 30th November:—April, 286 points; May, 93; June, 87; July, 160; August, 64; September, 99; October, 269; November, 12; total, 1,070 points.

Sowing was carried out between 16th April and 30th May. The early-sown trials received an excellent start, rain falling shortly after they were sown, and germination and early growth were rapid, enabling the plots to withstand the comparatively dry winter and early spring which followed. Germination was not quite as rapid or satisfactory in the late-sown trials, and they suffered more during the unfavourable growing conditions experienced later. Fortunately, as was the case last year, opportune rains fell early in October and resulted in much heavier yields being obtained than might have been expected.

Maximum benefit was obtained by the early-sown trials, and they responded in a remarkable manner. Unfortunately, however, the adverse conditions before mentioned forced the late-sown trials to head out much earlier than usual, with the result that they were too far advanced to benefit to the same extent as the early sown ones.

The plots were very free from weed growth, autumn rains resulting in their early germination and making possible destruction by cultivation.

Disease was not greatly in evidence, loose smut being the most prevalent. A little flag smut was present throughout the plots with the exception of Nabawa and Riverina. A trace of leaf rust was also present in most plots.

The land on which the experiments were sown consists of a red loam over a stiff subsoil of granitic origin and is fairly typical of the wheat land of this district. It was mouldboard-ploughed 4 inches deep in June, 1927, harrowed 6th September, springtooth cultivated 9th September, 19th December, and 6th January, 1928, skim-ploughed 8th February, and 5th March,

springtooth cultivated 13th April, harrowed 16th April, and harrowed again in May prior to sowing late trials. Sheep were used on the fallow from time to time for the destruction of weed growth.

Each variety was sown in triplicate on plots $\frac{1}{30}$ acre in area.

Early-sown Grain Varieties.

Seventeen varieties were sown in this trial, with Yandilla King as a check. Seed (previously treated with a bunticide) was sown at the rate of 56 lb. per acre and superphosphate at 60 lb. per acre on 20th April, 1928. Germination was excellent and the early growth rapid. Comparatively dry conditions in the winter and early spring months checked the growth somewhat, but all varieties responded well to the October rains. Throughout the growing period the plots were very even; at no stage was any particular variety outstanding. An average height of 3 feet was reached by all varieties except Duchess, Dilga, Colo, Condong, and Nizam, which were only 2 feet 6 inches high. Baringa (Yandilla King x Zaff x Bomen) gave the highest yield and now has the best average of this section since 1924. Unfortunately, it is rather more tough to strip than the others.

A little leaf rust was noticed in all plots. The plots otherwise were practically free from disease.

The following new varieties were tried :—

Sovereign (Penny x Canberra).—Same season as Federation. Yielded particularly well, and is the most promising of the new wheats.

Dundee (Hard Federation x Cleveland x Sands).—A very promising wheat; grew to a height of 3 feet 3 inches (the tallest in the trial); matures about a week earlier than Yandilla King.

Colo (Federation x Federation x Huguenot).—Short-strawed, Federation type, having the same season as Yandilla King.

Exquisite (Gluyas x Atalanta x Gluyas).—From South Australia; a dual-purpose variety, semi-solid straw; grew to a height of 3 feet; about the same season as Yandilla King.

Nizam.—Short-strawed, Federation type; matures a shade earlier than Yandilla King; rather small heads, particularly well filled with grain.

Craboon (Canberra x Hudson's Early Purple Straw).—Same season as Yandilla King; fairly tall growth (reached a height of 3 feet).

Condong (selection Hard Federation).—Short-strawed typical Federation type; did not make a particularly good showing, but worthy of further trial.

Gidley (Hard Federation x Penny).—Fairly tall grower, short plump head; same season as Yandilla King; very low on the list for the year, but shows promise.

All the above varieties held their grain well, but threshed readily.

YIELDS of Early-sown Grain Varieties.

Variety in Order of Merit.	Average acre yield, 1928.	Average acre yield over two or more years (numbers in parentheses).	Variety in Order of Merit.	Average acre yield, 1928.	Average acre yield over two or more years (numbers in parentheses).
	bus. lb.	bus. lb.		bus. lb.	bus. lb.
Baringa ...	35 20	30 37 (5)	Nizam ...	29 40	....
Duchess ...	31 30	30 3 (3)	Yandilla King ..	29 40	....
Sovereign ...	31 30	....	Wandilla ...	29 40	28 52 (5)
Bena	31 20	26 54 (5)	Federation ...	29 30	....
Rajah	31 20	28 6 (4)	Craboon ...	28 30	....
Dundee ...	31 20	....	Condong ...	28 0	....
Colo	30 20	....	Cadia	26 0	....
Exquisite ...	30 10	....	Gidley ...	25 30	....
			Dilga	23 20	25 39 (5)

Mid-season Sown Grain Varieties.

Sixteen varieties were included in this trial, with Waratah as a check. Sowing was carried out on 22nd May with treated seed at the rate of 66 lb. per acre with 60 lb. superphosphate. The seed-bed was in excellent condition and moist, but no rain of any consequence fell for three weeks after sowing, so germination was delayed. All varieties were affected by the dry conditions, which lasted until October, and " headed out " very early. These plots did not make the same recovery after the October rains as the early-sown plots. They reached an average height of 2 feet 9 inches, and were very even, but Binya and Early Bird did not stool as well as the others and were rather on the thin side. Duri gave the highest yield and has yielded on an average 2 bushels better than any other variety over three years.

All plots were very free from disease, except for a trace of flag smut. Nawaba, however, was free from this disease.

The following new varieties were tried :—

Gular (selection from Marshall's No. 3 x Wagga 13).—Gave the highest yield of the new varieties tried this year; a short-strawed variety, coming into ear four days earlier than Waratah.

Bogan (bred by Mr. Plowman, of Parkes).—Short-strawed, tip-bearded variety; about three days earlier than Waratah.

Early Bird (Hurst's No. 4).—The earliest maturing variety in the trial, being about a week earlier than Waratah; poor stooler, rather weak in straw.

Elfin (Penny x Thew).—The latest maturing variety in the trial, being over a fortnight behind Waratah. Grew to a height of 2 feet 9 inches, and was low down on the list as regards yield, the dry conditions apparently affecting it.

Garah (Bomen x selection Red Russian).—Four days later than Waratah; grew to a height of 3 feet, but was one of the poorest yielders in the trial.

YIELDS of Mid-season Sown Grain Varieties.

Variety in Order of Merit.	Average acre yield, 1928.	Average acre yield over two or more years (numbers in parentheses).	Variety in Order of Merit.	Average acre yield, 1928.	Average acre yield over two or more years (numbers in parentheses).
	bus. lb.	bus. lb.		bus. lb.	bus. lb.
Duri	32 0	32 33 (3)	Waratah ...	27 0	25 37 (4)
Bobin	30 30	28 56 (3)	Early Bird ...	26 0	....
Gular	28 50	....	Sands	25 40	27 52 (5)
Bald Early ...	28 40	29 40 (2)	Elfin	25 40	....
Binya	28 10	30 15 (2)	Canberra ...	25 0	27 10 (4)
Nabawa ...	28 10	30 36 (3)	Ranee	25 0	....
Aussie	28 0	28 55 (5)	Garah	25 0	....
Bogan	27 20	....	Nullah... ...	23 20	29 17 (5)

Grain Fertiliser Trial.

The aim of this experiment is to ascertain the best quantity of superphosphate to apply to grain crops in this district. The fertiliser was applied to $\frac{1}{30}$ acre triplicate plots at the rates of $\frac{1}{2}$ cwt., 1 cwt., $1\frac{1}{2}$ cwt., and 2 cwt. per acre, a no-manure plot being used as a check. Hard Federation was the variety used, treated seed being sown at the rate of 66 lb. per acre. Sowing was carried out on 25th May.

Germination was very fair but delayed, as was the case with other later-sown trials. Growth was somewhat retarded by the cold dry winter, the unmanured plot being particularly affected. Little difference could be detected between the heavier manured plots at any stage, but the $\frac{1}{2}$ cwt. plot was never quite up to their standard. The unmanured plot was about a week behind the manured ones in maturity, much thinner and about 3 inches shorter. Harvesting took place on 1st December.

YIELDS in Grain Fertiliser Trial.

Treatment in order of Merit.	Average acre yield, 1928.	Average acre yield since 1925.	Increase due to Treatment.	Cost of Increase.*	Net Gain.*
	bus. lb.	bus. lb.	bus. lb.	s. d.	£ s. d.
$1\frac{1}{2}$ cwt. superphosphate ...	29 10	26 53	11 30	9 $4\frac{1}{2}$	1 18 $6\frac{1}{2}$
2 ,, ,, ...	29 0	27 19	11 20	12 6	1 14 9
1 ,, ,, ...	28 0	26 19	12 20	6 3	1 16 10
$\frac{1}{2}$,, ,, ...	27 40	24 59	10 0	3 $1\frac{1}{2}$	1 18 $6\frac{1}{2}$
No manure	17 40	16 44	......	......	......

* Superphosphate is valued at 6s. 3d. per cwt., and wheat at 4s. 2d. per bushel.

Temora Experiment Farm.

K. G. CARN, H.D.A., Experimentalist.

This trial has been divided into three sections—(*a*) Early-sown grain wheats with Yandilla King as the standard, planting mid-April; (*b*) late-sown grain wheats, with Waratah as the standard, planting at the end of May;

(*c*) hay section, planting early in May, Gresley constituting the standard variety. The odd wheat-growing season experienced in 1928 provided an excellent example of the benefits to be derived from thorough cultural methods. Where the crops were planted on good fallows, with a liberal application of superphosphate, the root system was established early, an important factor in the production of payable yields after the dry spring.

During January, February, March, and April nearly 23 inches of rain fell and the fallows were heavily charged with moisture at time of seeding. Germination was good, and the young crops looked exceedingly promising, but the rainfall during August, September, and October did not come up to expectations, and the resultant crops were short, though filling a fair quantity of excellent quality grain.

The rainfall on fallow and the crop was as follows :—

1927.	Points.	1928.	Points.
June ...	158	February	574
July ...	157	March ...	504
August...	117	April ...	409
September	105	May ...	126
October	253	June ...	125
November	136	July ...	276
December	44	August...	102
1928.		September	52
January	784	October	102

The land was long summer fallowed, the initial working taking place in February with the disc cultivator, following a stubble burn. It was spring-toothed at the end of February and scarified in March, a good germination of rubbish being obtained before ploughing with the mouldboard 4 to 4½ inches deep in June and July. The land was springtoothed deep in August, and to restore the mulch the springtooth was used in October, November, the end of January, end of February, and the second week in April. In the case of the early-maturing group, the block was harrowed in May.

Diseases were not much in evidence. A trace of rust did not cause any damage to the yield. In the early-sown group flag smut was prevalent in some of the Federation crosses and Bredbo, Yandilla King being particularly free. The late-sown crops were not troubled. Loose smut was noticeable in Turvey.

Early-sown Grain Varieties.

This section was sown on 24th April, at the rate of 65 lb. seed with 1 cwt. superphosphate per acre.

Exquisite, although figuring in these trials for the first time, has given excellent yields in other parts and has good prospects. The variety's weak point is the straw, and feeding off will have to be practised to keep the straw short and prevent lodging. Gallipoli, the free-stripping strain, has experienced a year to suit its yielding capacity, and did well throughout the district. Yandilla King, the standard variety, gave a very satisfactory yield, the plots being even and the variety stripping well. The highest average yield is still held by Union. An interesting point was the yield of Longerenong Federation, the Temora farm seed proving equal to the introduced strain.

YIELDS of Early-sown Grain Varieties.

Variety in Order of Merit.	Yield, 1928.		Average yield since 1926.	
	bus.	lb.	bus.	lb.
Exquisite	37	40*	....	
Gallipoli	37	20	30	0
Yandilla King	36	0	30	20
Rajah	35	40	27	47
Bredbo	35	20	28	40
Turvey	35	0	28	23
Bena	35	0	27	37
Wandilla	34	40	26	30
Duchess	34	40	30	30
Temora Federation	34	20	27	33
Longerenong Federation	34	20*	....	
Union	33	40	31	17
Penny	33	20*	....	
Major	33	0	27	43
Sands	32	40	30	20
Cadia	32	40*	....	
Nizam	32	20	32	10
Garah	30	40*	....	

* Indicates first year of trial.

Late-sown Grain Varieties.

Sowing was carried out on 23rd and 24th May, using 78 lb. of seed and 1½ cwt. of superphosphate per acre.

Bobin has now topped the yields two years in succession and holds the highest average for this section. This variety promises to demand attention in dry areas and replace Waratah to a certain extent. Waratah, Aussie, Gullen, and Caliph gave remarkably good yields, but Gullen was tough to strip.

YIELDS of Late-sown Grain Varieties.

Variety in Order of Merit.	Yield, 1928.		Average yield since 1926.	
	bus.	lb.	bus.	lb.
Bobin	31	40	29	40
Waratah	30	0	26	30
Aussie	29	40	26	37
Gullen	29	20	27	10
Caliph	29	10	26	30
Duri	28	40	26	57
Baroota Wonder	28	40	28	23
Nabawa	28	40	26	7
Bald Early...	28	0*	....	
Hard Federation	28	0	24	53
Garra	28	0*	....	
Canberra	27	40	26	30
Gluyas Early	27	20	29	40
Ranee	26	20	25	30

* Indicates first year of trial.

Hay Varieties.

Only three varieties have been retained in this class, owing to the limitations of hay production in the district. Sowing was carried out on 9th May, using 65 lb. seed and 84 lb. of superphosphate per acre. Waratah retained the best average and forms the recommendation for farm chaff, but Gresley undoubtedly produced the market quality.

YIELDS of Hay Varieties.

Variety in Order of Merit.	Yield, 1928.				Average yield since 1926.			
	tons	cwt.	qrs.	lb.	tons	cwt.	qrs.	lb.
Gresley	2	10	2	14	2	0	3	24
Waratah... ...	2	9	3	18	2	1	2	13
Firbank	2	7	3	12	1	17	0	16

Pure Seed.

GROWERS RECOMMENDED BY THE DEPARTMENT.

THE Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney, not later than the 12th of the month.

Maize—

Fitzroy ... Manager, Experiment Farm, Grafton.
Leaming ... Manager, Experiment Farm, Grafton.
Wellingrove... Manager, Experiment Farm, Glen Innes.

Sorghum—

Collier ... Under Secretary, Dept. of Agriculture, Box 36A, G.P.O., Sydney.
Feterita ... Under Secretary, Dept. of Agriculture, Box 36A, G.P.O., Sydney.
Gooseneck ... Under Secretary, Dept. of Agriculture, Box 36A, G.P.O., Sydney.
Saccaline ... Under Secretary, Dept. of Agriculture, Box 36A, G.P.O., Sydney,
Sumac ... Manager, Experiment Farm, Bathurst.
White African Under Secretary, Dept. of Agriculture, Box 36A, G.P.O., Sydney.

Millet—

Japanese ... Manager, Experiment Farm, Coonamble.

Broom Millet—

Manager, Experiment Farm, Coonamble.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Maize Varieties.

Departmental Recommendations for Different Districts.

The following are the varieties of maize recommended for different purposes in the various districts. These recommendations represent the results of many years' trials on farmers' experiment plots.

APPROXIMATE ORDER OF MATURITY OF VARIETIES RECOMMENDED.

Very Early.—Early Morn, Golden Glow.

Early.—Wellingrove, Gold Coin, Golden Superb, Funk's 90-Day, Kennedy, Iowa Silvermine, Funk's Yellow Dent, Iowa Goldmine, Auburn Vale, Craig Mitchell, Goldmine Crossbred.

Midseason.—Hickory King, Leaming, Golden Nugget, Early Clarence, Golden Beauty, Boone County White, Manning Silvermine, Manning White.

Late.—Yellow Hogan, Fitzroy, Large Red Hogan, Yellow Moruya, Ulmarra Whitecap, Bega Yellow, Pride of Hawkesbury.

VARIETIES RECOMMENDED FOR GRAIN.

Upper North Coast.

(a) *Tweed River.*

Early Crop.—Leaming, Craig Mitchell, Iowa Silvermine.
Main Crop.—Fitzroy, Ulmarra Whitecap, Large Red Hogan (for early sowing only).

(b) *Lower Richmond River.*

Early Crop.—Hickory King (second-class soils only), Leaming.
Main Crop.—Golden Nugget (second-class soils only), Fitzroy.

(c) *Upper Richmond River.*

Early Crop.—Leaming.
Main Crop.—Fitzroy, Large Red Hogan, Ulmarra Whitecap.

(d) *Clarence River.*

Early Crop.—Leaming.
Main Crop.—Fitzroy, Ulmarra Whitecap.
Second-class Soils.—Golden Nugget, Hickory King.

(e) *Bellinger River.*

Early Crop.—Leaming, Iowa Silvermine.
Main Crop.—Fitzroy, Ulmarra Whitecap.

NORTH COAST TABLELAND.

Dorrigo and Comboyne Districts.

Main Crop.—Leaming, Golden Superb, Golden Nugget.

MIDDLE NORTH COAST.

(a) Nambucca River.

Early Crop.—Golden Superb, Leaming.
Main Crop.—Fitzroy, Yellow Hogan.

(b) Lower Macleay River.

Early Crop.—Funk's Yellow Dent, Golden Superb.
Main Crop.—Fitzroy, Large Red Hogan, Yellow Hogan, Golden Beauty, Pride of Hawkesbury, Manning Silvermine.

(c) Upper Macleay River.

Early Crop.—Golden Superb, Funk's Yellow Dent.
Main Crop.—Large Red Hogan, Fitzroy, Yellow Hogan.

(d) Hastings River.

Early Crop.—Funk's Yellow Dent, Craig Mitchell.
Main Crop.—Fitzroy, Large Red Hogan, Golden Beauty.

(e) Lower Manning River.

Early Crop.—Funk's Yellow Dent, Craig Mitchell.
Main Crop.—Fitzroy, Large Red Hogan, Yellow Hogan, Pride of Hawkesbury, Manning Silvermine, Manning White.

(f) Upper Manning River.

Early Crop.—Golden Superb, Funk's Yellow Dent, Iowa Silvermine, Craig Mitchell.
Main Crop.—Fitzroy, Leaming, Golden Beauty, Yellow Hogan.

CENTRAL COAST.

(a) Lower Hunter River.

Early Crop.—Funk's Yellow Dent, Craig Mitchell, Golden Superb.
Main Crop.—Large Red Hogan, Fitzroy.

(b) Hawkesbury River.

Early Crop.—Golden Superb.
Main Crop.—Large Red Hogan, Fitzroy, Yellow Hogan, Leaming.

(c) County Cumberland.

Early Crop.—Hickory King.
Main Crop.—Fitzroy.

South Coast.

(*a*) *Illawarra District.*

Early Crop.—Funk's Yellow Dent, Iowa Goldmine, Iowa Silvermine, Craig Mitchell.

Main Crop.—Large Red Hogan, Fitzroy, Yellow Hogan.

(*b*) *Shoalhaven River.*

Early Crop.—Funk's Yellow Dent, Craig Mitchell.

Main Crop.—Leaming, Funk's Yellow Dent, Fitzroy, Boone County White.

(*c*) *Milton District.*

Early Crop.—Funk's Yellow Dent, Craig Mitchell, Iowa Goldmine, Iowa Silvermine.

Main Crop.—Fitzroy, Large Red Hogan, Leaming.

(*d*) *Moruya River.*

Early Crop.—Funk's Yellow Dent, Craig Mitchell.

Main Crop.—Large Red Hogan, Yellow Moruya.

(*e*) *Bega River.*

Early Crop.—Funk's Yellow Dent, Craig Mitchell, Iowa Goldmine, Iowa Silvermine.

Main Crop.—Large Red Hogan, Yellow Moruya, Golden Beauty, Bega Yellow, Yellow Hogan.

Northern Tableland.

(*a*) *Tenterfield District.*

Wellingrove, Funk's Yellow Dent, Golden Glow, Iowa Silvermine.

(*b*) *Glen Innes District.*

Strong Soils.—Wellingrove, Iowa Goldmine, Goldmine Crossbred.

Light Soils.—Wellingrove, Iowa Silvermine.

(*c*) *Ben Lomond, Llangothlin, Guyra, and Black Mountain Districts.*

Early Morn, Golden Glow.

(*d*) *Armidale District.*

Funk's Yellow Dent, Wellingrove, Golden Glow, Gold Coin, Golden Superb.

(*e*) *Uralla District.*

Wellingrove.

CENTRAL TABLELAND.

(*a*) *Bathurst District.*

Alluvial Soils.—Funk's Yellow Dent, Iowa Silvermine.

Upland Soils.—Iowa Silvermine.

(*b*) *Colder Districts.*

Early Morn.

SOUTHERN TABLELAND.

Moss Vale District.

Golden Glow.

NORTH-WESTERN SLOPES.

(*a*) *Inverell District.*

Heavy Soils.—Funk's Yellow Dent, Kennedy, Auburn Vale, Funk's 90-Day.

Light Soils.—Wellingrove, Iowa Silvermine.

Late Sowing.—Early Morn, Golden Glow.

(*b*) *Tamworth and Upper Hunter Districts.*

Alluvial Soils.—Funk's Yellow Dent, Iowa Silvermine.

CENTRAL-WESTERN SLOPES.

Alluvial Soils.—Funk's Yellow Dent, Iowa Silvermine.

Upland Soils.—Iowa Silvermine, Early Morn.

SOUTH-WESTERN SLOPES.

(*a*) *Tumut River.*

Rich Alluvial Flats.—Main Crop (October sowing), Early Clarence: Early Maize (late sowing), Funk's Yellow Dent, Craig Mitchell.

Second-class Alluvials.—Funk's Yellow Dent, Iowa Silvermine.

(*b*) *Murrumbidgee River* (*Gundagai District*).

Funk's Yellow Dent, Iowa Silvermine, Golden Glow.

MURRUMBIDGEE IRRIGATION AREAS.

Funk's Yellow Dent, Iowa Silvermine.

VARIETIES RECOMMENDED FOR GREEN FODDER.

COASTAL DISTRICTS.

Early Varieties.—Hickory King, Leaming, Craig Mitchell.

Late Varieties.—Fitzroy, Pride of Hawkesbury, Ulmarra Whitecap, Whitecap Horsetooth.

TABLELAND DISTRICTS.

For Warmer Districts.—Fitzroy.

For Cooler Districts.—Hickory King, Leaming.

For Coldest Districts.—Wellingrove.

WESTERN SLOPES AND MURRUMBIDGEE IRRIGATION AREAS.

Fitzroy.

Bean Trials, 1928-29.

Farmers' Experiment Plots Demonstrate Value of Tweed Wonder.

Central Coastal Districts.

J. DOUGLASS, H.D.A., H.D.D., Agricultural Instructor.*

A NUMBER of bean experiments were conducted during the past season in the metropolitan area and Gosford and Newcastle districts. The object of these trials was to ascertain the most profitable manures to use and the best varieties to grow.

The very early planted beans on the coast germinated excellently, and, of the unirrigated crops, they did better than the later planted ones. This was entirely due to the amount of moisture that had been conserved in the soil, as from July, 1928, till the following February there were practically no useful rains, the season being, without exception, the driest ever experienced by growers in these districts. Later planted beans germinated badly and in most cases were a failure, excepting on the lower land where the crops obtained moisture by seepage.

On the other hand, the season was an excellent one for vegetable-growers who irrigated. The dry weather was responsible for a warmer soil, which was conducive to earlier growth, and when water could be applied at the correct time excellent crops of beans were obtained. However, as the majority of bean experiments were conducted on dry areas the yields in these cases were very low and were not comparable.

The manurial trials could be classed as a failure. However, a test carried out at Tascott by Mr. H. Eastwood is of general interest, and supports the Department's recommendations. Mr. Eastwood practises irrigation and obtained a yield of over 300 bushels per acre. The fertiliser which produced the heaviest yield was basic superphosphate.

An Outstanding Variety—Tweed Wonder.

As with most vegetable crops, beans are becoming more difficult to grow each year owing to the prevalence of disease. The two worst diseases are pod spot and fusarium root rot. In the large bean-growing areas of the Tweed, Richmond, and Gosford districts these diseases are taking a big toll each year, and prevent the growing of this crop on the same soil for more than one season. While visiting the Tweed district three years ago, Mr. A. J. Pinn, Special Agricultural Instructor, selected several plants in a diseased patch of beans, which were apparently immune to these troubles.

*** No seed of Tweed Wonder variety is available for this coming season, all supplies on hand being required for sowing for the production of seed for next year.**

Tests carried out at Bathurst Experiment Farm and in co-operation with private growers have proved that not only is this variety—Mr. Pinn has since named it Tweed Wonder—apparently resistant to pod spot and root rot, but is also a superior yielder and, in some cases, an earlier maturer than Canadian Wonder.

Variety trials carried out for many years with a large number of varieties failed to reveal a variety that could in any way compare with Canadian Wonder, until Tweed Wonder was tried out on commercial areas last year in various districts. Owing to the very dry conditions in some localities no comparative figures were obtained, although in every case growers favourably commented on the merits of the selection.

Mr. T. W. Brown, of Wallsend-road, Cardiff, carried out a trial in conjunction with the Department, Canadian Wonder being tested against this selection. Both plots received a uniform dressing of basic superphosphate. There was practically no rain of any importance during the growing period, water being pumped from a creek, and supplied through an overhead irrigating system.

The following table gives the results of the pickings:—

RESULTS of Trial on Mr. T. W. Brown's Farm.

Date of Picking.	Tweed Wonder.		Canadian Wonder.	
	bus.	lb.	bus.	lb.
2nd January	9	12	30	0
5th "	75	0	30	0
9th "	90	0	45	0
14th "	75	0	45	0
Total	249	12	150	0

Although Tweed Wonder did not prove to be quite as early as the Canadian Wonder in this trial, there is everything to recommend it as a commercial variety. The comparison in top growth was outstanding. Even from the earliest stages the selection made the more vigorous growth. It responded to good cultural treatment, and stood up to adverse weather conditions admirably. Being a dry year no disease was noticed.

Another very outstanding feature of this trial was the remarkable sturdiness of the old plants after the trial had been concluded. It was shortly after that time that the dry spell broke and Mr. Brown made a fair picking from this plot, which produced new growth.

In Tweed Wonder, Mr. Pinn has undoubtedly given the bean growers of the State something in the variety line that has been looked for, for some time. The pods of this selection are borne more prolifically and are inclined to be rather shorter in length than the Canadian Wonder, although consignments despatched to Sydney could not be distinguished from that

variety by agents. A characteristic of the seed is that the ends are cut off abruptly, and as it is inclined to be small, a bushel will plant a bigger area than will a bushel of the larger seed.

Upper North Coast.

M. J. E. SQUIRE, H.D.A., Agricultural Instructor.

Trials were conducted during the past season in co-operation with the following farmers:—

A. Wilson, Terranora, Tweed River.
N. Joubert and Sons, Terranora, Tweed River.
P. Banney, North Arm, Murwillumbah.
P. Steer, Upper Burringbar.

The object of these trials was to test Tweed Wonder bean (a selection from Canadian Wonder made in the Tweed district) for its resistance to pod spot (anthracnose), and to compare it in that and other respects with Canadian Wonder, which is the standard variety for the district.

The areas of the plots averaged about ¼ acre. The season was very unfavourable, dry weather setting in immediately after planting and continuing throughout the growing period. The results were sufficiently conclusive, however, to warrant further work with this strain.

On Mr. A. Wilson's farm the yields obtained were as follows:—Tweed Wonder, 21 bushels; Canadian Wonder, 16 bushels. The area harvested on each plot was ¼ acre. These results were obtained on new land. A few rows were also planted on old land and the yields were as follows:—Tweed Wonder, 20 lb.; Canadian Wonder, 12 lb. The area harvested on each plot was one row 4 chains long; the rows were 2 feet 6 inches apart.

On Messrs. N. Joubert and Sons' farm the yields were as follows:—The first picking of Tweed Wonder yielded twice that of the Canadian Wonder plot, the second and third pickings about one-third the yield of Canadian Wonder.

Tweed Wonder was earlier in maturing than Canadian Wonder, and the beans were far more advanced at the first picking. Probably this may have been responsible for the lower yields at the second and third pickings.

On Messrs. Banney's and Steer's farms the plots were not harvested, owing to the dry weather.

From observations made on the plots at the various centres at which the trials were conducted the germination was far superior, and the young seedlings were much healthier, sturdier, and of a darker green appearance than the Canadian Wonder. The beans were ready for picking a week earlier, the pods were fairly straight and of a slightly lighter green colour, and do not rub with the wind like the Canadian Wonder.

The weather conditions being very dry, pod spot (anthracnose) did not make its appearance in any of the crops, and observations, therefore, could not be made as to resistance to this disease.

Farmers' Experiment Plots.

POTATO TRIALS, 1928.

Lower North Coast.

J. M. PITT, H.D.A., Senior Agricultural Instructor.

Variety and manurial trials were conducted on the following farms during the 1928 season:—

J. G. Ward, Sherwood, Macleay River.
J. P. Mooney, Dumaresq Island, Manning River.
W. H. Abbott, Wingham, Manning River.
C. Shields, Mt. George, Manning River.
M. Smith, Paterson.

In addition, two trials on a very small scale were carried out in co-operation with Messrs. R. Baynes, Cedar Party Agricultural Bureau, and Robert Lean, Fosterton Agricultural Bureau.

The Season.

The season was very dry, very little rain of use falling on any of the plots. The Sherwood plot was possibly the better favoured, one or two storms helping the crop during November. On the Manning very little useful rain fell, if one omits a severe hailstorm which severely bruised and cut down Mr. J. P. Mooney's plot. At Fosterton less than two inches of rain fell during growth. Useful rain, however, fell during June and July, and this gave farmers the opportunity of conserving moisture in the soil. Messrs. Mooney, Abbott, and Ward's plots were particularly good in this respect, which probably accounted for these growers obtaining the heaviest yields.

The rain registrations recorded were as follows:—

	Sherwood. Points.	Taree. Points.
July	169	307
August	40	68
September	8	0
October	172	138
November	170	72
Totals	559	585

Considerably less rain fell at Wingham and Cedar Party, and at Paterson, Fosterton and Mount George the registrations were negligible. Mr. Smith, at Paterson, irrigated several times.

The Plots.

Sherwood.—Sown on loamy soil; previous crops winter fodders (oats and peas). Ploughed during second week in August and then harrowed; sown 31st August. Up-to-Date variety has always done better than any other in

this neighbourhood, and this year's results were no exception. Of the fertilisers used, P11 and P13 gave the best results. Considering the season, the results at this centre were very satisfactory.

Dumaresq Island.—This plot was on new land, having a thickly matted paspalum sod, and which had been ploughed the previous November. Soil medium to heavy alluvial loam. Ploughed July after maize, rolled and double disced, and double harrowed; sets ploughed in on 14th August, the soil being perhaps a little dampish. The plot was severely damaged by hail, but had advanced to such a stage at the time the damage was done that it recovered well. Factor and Up-to-Date varieties shared the honours at this centre, while P13 and farmyard manure proved the best of the fertilisers.

RESULTS of Variety Trial.

Variety.	Dumaresq Island.	Wingham.	Paterson.	Sherwood.	Mount George.	Cedar Party.	Fosterton.
	t. cwt.	t. cwt.	t. cwt.	t. cwt.	t. cwt.	t. cwt.	t. cwt.
Up-to-Date	7 3	7 7	6 11	5 16	4 11	...	...
Early Manistee ...	6 17	5 3	5 13	4 17	4 10	6 0	1 15
Satisfaction	6 19	6 4	5 13	4 15	5 12	4 5	2 1
Factor	6 11	8 8	6 2	4 15	5 11	7 5	2 3

RESULTS of Fertiliser Trial.

Fertiliser.	Dumaresq Island.	Sherwood.	Mt. George.	Cedar Party.
	t. cwt.	t. cwt.	t. cwt.	t. cwt.
Farmyard manure (5 tons per acre) ...	6 19	...	...	...
P11 mixture (326 lb.)	6 13	6 4	5 14	...
Superphosphate (2½ cwt.)	6 10	5 8	...	...
Superphosphate (5 cwt.)	...	5 7	6 8	...
P13 mixture (372 lb.)	7 4	5 18	5 18	...
No manure	6 11	5 16	5 12	...
Fowl manure (3 tons) and superphosphate (3 cwt.)	...	...	...	4 5
Superphosphate (3 cwt.)	...	...	...	3 0

NOTE.—P11 mixture consists of 6 parts superphosphate and 1 part sulphate of ammonia; P13 mixture consists of 6 parts superphosphate, 1 part sulphate of ammonia, and 1 part sulphate of potash.

Mt. George.—This trial was sown on an old lucerne bed of alluvial loam. Ploughed in 1927, and sown to oats and peas and then grazed off; pumpkins were sown in 1928. Ploughed early in July, disc harrowed twice, harrowed and rolled; sown 27th August, the land being in a fairly good condition. Factor variety did best here also. Of the fertilisers used, 5 cwt. superphosphate and P13 were outstanding, although the dry conditions were not favourable to obtaining the best results from fertilisers.

Wingham.—Heavy alluvial brush soil, which had been cropped for many years; previous crop maize. Ploughed in July, rolled, harrowed and disced twice; sets ploughed in on 17th August. There was an occasional miss in

the Up-to-Date and Early Manistee varieties. Factor looked very fine, but a little virus disease was to be found, both in the plots of Up-to-Date and Factor. Only marketable potatoes were included in the yields from this plot.

Cedar Party.—Light, shallow hillside soil, regarded as second-class, under vegetables for a number of years. Ploughed twice and sown on 22nd August. Fowl manure at the rate of 3 tons plus 3 cwt. superphosphate per acre was tried out against 3 cwt. superphosphate alone. The application of fowl manure gave much the better results, the increased yields amounting to 2 tons and over, and the plots on which fowl manure was used germinated three to four days earlier than the others.

Fosterton.—Alluvial soil, but not of great depth. The trial was on new land, which was ploughed three times, and worked into a fine tilth; sets ploughed in on 3rd September, in rows 2 feet 6 inches apart. Owing to the dry conditions these plots hardly had a chance. Factor yielded best.

Paterson.—Sandy loam, ploughed twice and scarified; sown on 21st August in rows 2 feet 6 inches apart. Fertilised with superphosphate at the rate of 2½ cwt. per acre. It was necessary, owing to the exceptionally dry conditions, to irrigate three times. Up-to-date and Factor yielded better than the other varieties.

The Value of Herd Recording.

The dairy herd improvement association records are a gold mine of useful information. Their purpose is twofold—to test the cows and to prove the sires, says Mr. J. C. McDowell, of the Bureau of Dairy Industry, United States Department of Agriculture.

From a study of these records he finds that the cows having an average butter-fat production of 100 lb. a year make an average income over cost of feed of $14 (about £2 19s.); those producing 200 lb. per year return $55 (about £11 10s.) over cost of feed. The next 100 lb. increase in production per cow raises the income over cost of feed to $96 (about £20); the next to $138 (about £28 15s.); and the next to $178 (about £37). Briefly stated, as butter-fat production increased from 100 lb. to 500 lb. per cow, the income over cost of feed advanced from $14 (£2 19s.) to $178 (£37), or as the butter-fat production increased five times, the income over cost of feed increased thirteen times. Evidently it pays to keep good cows.

All dairy herd improvement, says Mr. McDowell, must come through culling, feeding and breeding. Through the dairy herd improvement association records the dairyman is enabled to cull out his low producers, to feed the remainder according to known production, and to breed intelligently.

When the production records of from five to ten unselected daughters of a sire are compared with the production records of their dams, the breeding value of the sire is indicated. If his daughters' records are unsatisfactory, the sire is condemned. A dairy cow is condemned by her own record.

A Useful Type of Self Feeder for Sheep.

J. RONALD MACKEE, H.D.A., Sheep and Wool Instructor.

No matter how well selected or bred sheep may be, it is generally acknowledge that a considerable amount of the quality obtained is due to correct feeding. And in order to obtain the best results in this connection it is necessary to supply a well-balanced ration. This may be done by various means, such as providing food in the form of suitable crops, improving the pastures, and by hand-feeding.

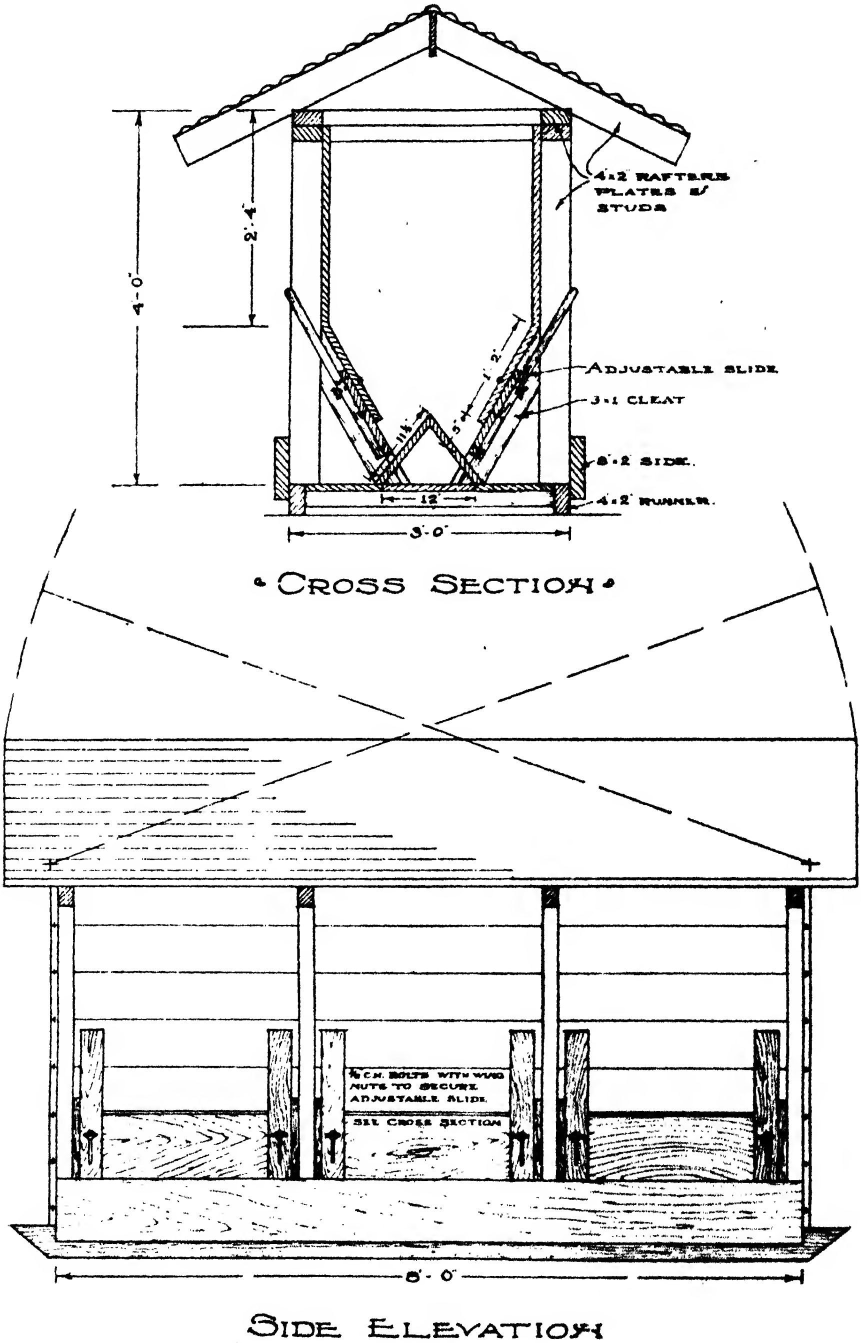
Hand-feeding generally becomes necessary in most districts during dry periods, or where the natural pastures are somewhat deficient in one or more of the essential nutrients, viz., protein, carbohydrates, fats, or minerals, in which cases the nutritive ratio is either too wide or too narrow. Hand-feeding is very essential in the development of young stock, *e.g.*, weaners.

From an economic point of view it is important that most attention be given to feeding during the first twelve to fifteen months of the sheep's existence, for it is during that period that the animal largely develops and builds up its body, framework, constitution, &c., on which is dependent its ability to produce wool and mutton. Therefore, it is often necessary to provide, as an addition to the natural pasture, a certain amount of foodstuff, in order to maintain size, general quality, and vigour in the animal.

Many methods have been adopted in the hand-feeding of sheep, but one which has proved successful and should commend itself to every sheep-owner is the feeding of at least some of his sheep by means of a self-feeder. These feeders are particularly useful for feeding rams being prepared for show, stud, sale or service, and for small flocks during dry periods.

The advantages gained by this system of hand-feeding are of considerable importance, and can be enumerated as follows:—

1. The food is available to the sheep at any time. It is natural for a sheep to obtain its food whenever it requires it, consequently the advantage is fairly obvious, when compared with ordinary hand-feeding, which is carried out at specified times, and, as is often the case, the best results are not obtained.
2. The sheep cannot walk or excrete in the feed troughs.
3. The fodder is protected from being damaged by unfavourable weather conditions or blown away, thus eliminating a considerable waste.
4. There is a saving in time, labour, and attention, as the feeder is only filled periodically. With ordinary hand-feeding it is necessary for someone to devote a considerable amount of his time every day to "feeding up." Present-day wages thus add a great amount to the cost of ordinary hand-feeding. The self-feeding system, on the other hand, requires but a few hours' attention approximately once a fortnight.



A Self-feeder for sheep.

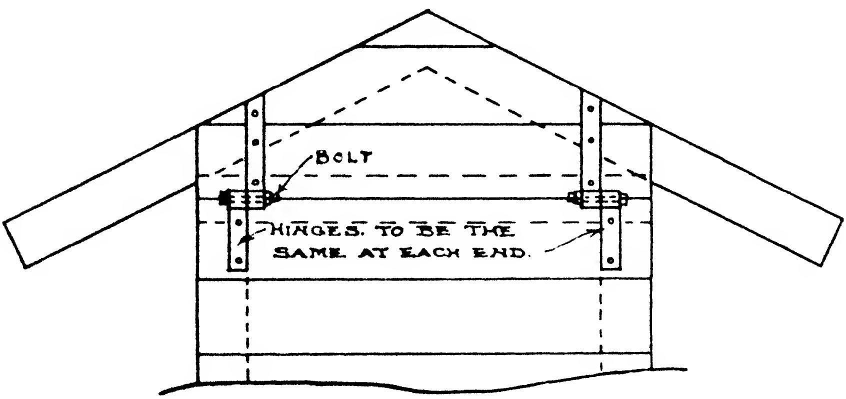
5. With ordinary hand-feeding, the stronger sheep obtain the best of the feed, and more than their share, to the detriment of the weaker ones. By using a self-feeder this is prevented.

Construction.

This feeder is not expensive to build, and anyone with a fair knowledge of bush carpentry should be able to put it together without much difficulty. The total cost, including labour, would be from £8 to £10.

Construct the base with 4-inch x 2-inch hardwood runners and 4-inch x 2-inch trimmers on flat, tenoned to runners and set 1 inch from top of same to form floor joists.

Flooring to be laid longitudinally in three pieces, as shown on cross section. Studs and plates to be 4 inches x 2 inches, studs to be housed ⅜ inch into top plates and runners. From each stud to floor, at the angle shown, fix 4-inch x 2-inch trimmers to take inside lining.



PART END ELEVATION

Centre portion to be made of two 12-inch x 1-inch boards, mitred at top and each splayed on the other edge to floor, to be fixed to triangular pieces of 1-inch stuff fixed to floor.

Line the sides internally and ends externally with 6-inch x 1-inch T. and G. lining, leaving opening at sides 5 inches wide, as indicated on drawings.

Adjustable slides are to be of 12-inch x 1-inch material, cut to fit between studs, with 3-inch x 1-inch cleats securely screwed to same, cleats to be 24 inches long, projecting 12 inches beyond slide as shown. Slides and cleats to be slotted as indicated, and secured with cuphead bolts with winged nuts and washers. Put 3-inch x 1-inch cleats fixed to either side of 4-inch x 2-inch trimmers to form groove to take slide.

Put 8-inch x 2-inch timber to sides at bottom as shown, and securely fix to studs and runners.

Roof to be made with 4-inch x 2-inch rafters splayed to 6-inch x 1-inch ridge, and birdsmouthed over separate 4-inch x 2-inch plate, which is to be halved at angles, and the whole securely fixed. Cover with 26-gauge galvanised corrugated iron fixed horizontally with 1¾-inch galvanised roofing screws and lead washers. Gable ends to be enclosed as for ends of feeder.

Another Type of Self-feeder.

The roof is to be hinged at both ends with hinges as shown on the drawings, each fitted with cuphead bolts, so that by removing the bolts at either end the roof will lift at that end. If desired for cleaning purposes the pins can be taken out at both ends, and the roof removed.

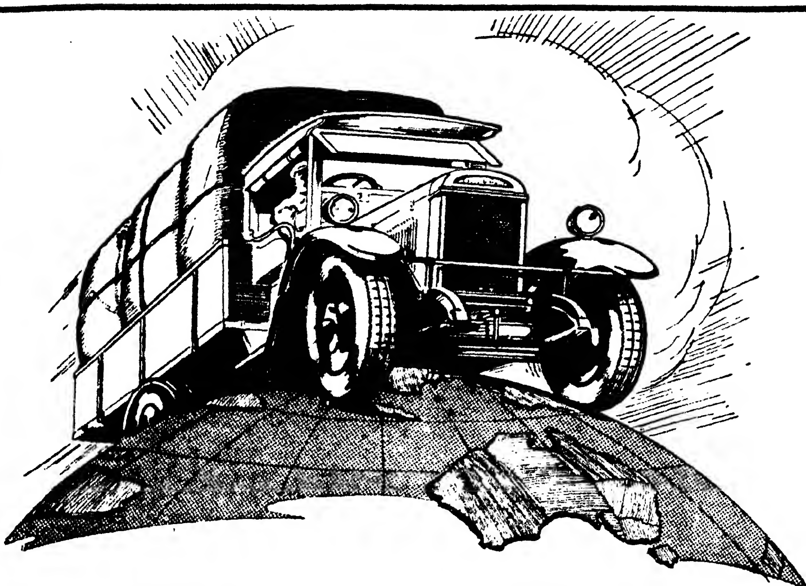
Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36a, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1929.

Trundle (W. P. Forrest)	Aug.	6, 7
Gilgandra (G. Christie)	,,	13, 14
Condobolin (J. M. Cooney)	,,	13, 14
Illabo	,,	14
Lake Cargelligo	,,	20, 21
Wagga (F. H. Croaker)	,,	20, 21, 22
Bogan Gate (J. T. A'Beckett)	,,	21
Junee (G. W. Scrivener)	,,	27, 28
Grenfell	,,	27, 28
Parkes (L. S. Seaborn)	,,	27, 28
Henty (J. Lovell)	,,	27, 28, 29
Ungarie	,,	28
Galston (W. J. Fagan)	,,	31
West Wyalong	Sept.	3, 4
Corowa (H. G. Norton)	,,	3, 4
Forbes (K. O. Anderson)	,,	3, 4
Young (T. A. Tester)	,,	4, 5
Gosford (J. S. Gardiner)	,,	6, 7
Ganmain (C. C. Henderson)	,,	10, 11
Cowra	Sept.	10, 11
Albury (A. G. Young)	,,	10, 11, 12
Barmedman	,,	11
Canowindra	,,	17, 18
Temora	,,	17, 18, 19
Murrumburrah	,,	24, 25
Barellan	,,	25
Boorowa	,,	26, 27
Ardlethan	Oct.	2
Quandialla	,,	2
Walbundrie (H. G. Collins)	,,	2
Narandera (J. D. Newth)	,,	8, 9
Manildra (P. Rubie)	,,	8, 9
Ariah Park	,,	9
Bribbaree	,,	9
Griffith	,,	15, 16
Caronar	,,	16
Cootamundra (R. D. Beaver)	,,	22, 23
Deniliquin (D. Fagan)	,,	22, 23

Without our insectivorous birds the gardener and farmer would find it impossible to grow any crops at all.



A Serviceable Cream Pipe Rack for Butter Factory Use.

J. D. L. McGIBBON, H.D.D., H.D.A., Assistant Dairy Instructor.

To ensure the thorough cleaning of cream and milk piping used in dairy produce factories, it is necessary to have every convenience for carrying out the work and also for keeping the parts clean and in good condition until they are required for use again. Often-times these pipes, which are of varying lengths, are either re-assembled immediately they are cleaned, or allowed to remain on the cream-receiving platform, where they are often in the way and likely to be re-contaminated by being splashed with water used for washing down floors, &c. Exposure to clean fresh air has a sweetening effect on these pipes, and consequently they should be so arranged as to enable dust-free air to pass through them continuously while they are not in use.

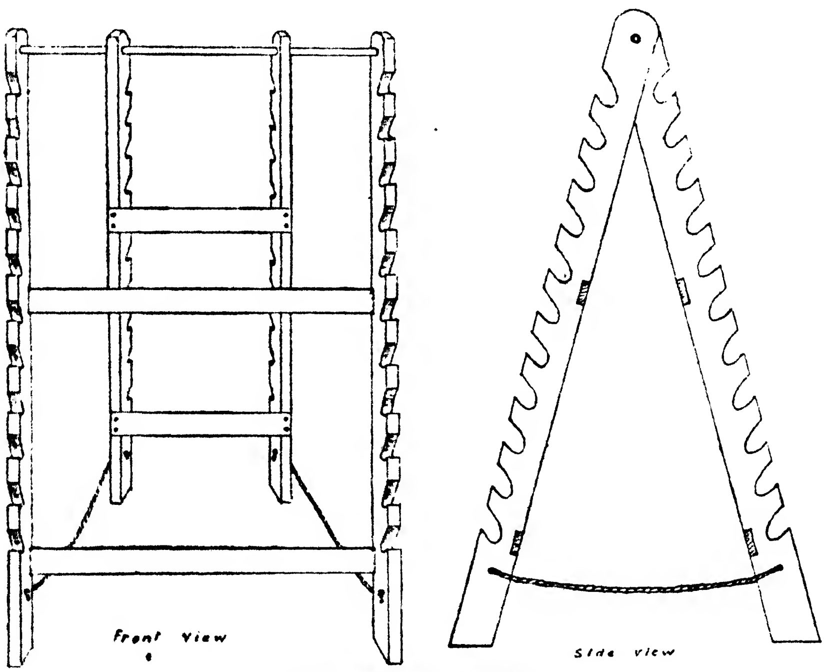


Diagram of Cream Pipe Rack.

For this purpose a pipe rack of the style illustrated can be very easily constructed. This rack is so designed that it can be easily moved about, and, when not in use, it can be folded up like a step-ladder and conveniently placed out of the way. It consists of four pieces of dressed timber

7 feet long by 6 inches wide by $1\frac{1}{2}$ inches thick, one edge of each piece having notches cut at intervals of 6 inches, as shown in the drawing. These notches are large enough to hold pipes of any diameter, and the longer pipes are placed on one side and the shorter pipes on the other side of the rack. To form a hinge and to connect these sides together a short length (4 feet) of $\frac{3}{4}$-inch pipe is all that is required. This acts as a shaft on which the sides move. The one side is braced with two cross-pieces of timber 4 feet long by 3 inches wide, while the other side is similarly braced with two 2-feet lengths of 3 inch timber. Two 3-feet lengths of rope to prevent too great a spread of the sides are all that is required to complete the rack.

Factory employees will find this pipe rack very simple to construct and most convenient to use. Racks of similar design are at present being used with very satisfactory results at the Upper Wallamba and Wingham butter factories.

Dairy Science Schools.

During the next two months the Department of Agriculture has arranged to hold a number of dairy science schools throughout the State for the convenience of dairy produce factory employees who are desirous of qualifying as cream graders and milk and cream testers under the Dairy Industry Act. The centres at which the schools are to be held and the dates are as follows:—Tamworth (12th to 16th August), Hexham (26th to 30th August), Wagga Wagga (9th to 13th September), Bega (16th to 20th September), Moss Vale (30th September to 4th October).

Applications for attendance or for further particulars should be made to the Under Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney, or to the Director of Dairying, 25 O'Connell-street, Sydney.

The Possibilities of Co-operation.

The tendency to disparage the idealistic side of co-operation is general, and agriculturists often maintain that co-operation can be judged only by its business results. In reality the cleavage between the idealistic and material standpoints is more apparent than real. It is true that co-operation will not be sustained by mere propaganda, but it is equally true that efforts to secure better financial results are hampered by ignorance of co-operative and general business principles on the part of members and those controlling societies. In the past, farmers have criticised their own movement, often unfairly. They have judged its benefits by short-period results only, without realising that in it they have the foundation of a system which they can themselves control, and which has immense possibilities in moulding the agricultural and rural life of this country.—A. W. Ashby and J. Morgan Jones, in the *Journal of the Ministry of Agriculture.*

Some Factors Adversely Affecting Butter Quality.

A. M. BROWN, Special Dairy Instructor.*

WITH but few exceptions the butter produced in New South Wales factories during the present season shows a decided falling off in quality as compared with the production throughout the year ended 30th June, 1928.

Similar faults to those noted last season have still been apparent in our butter. These faults were each described and dealt with fully in a paper presented at your conference in June of last year. Therefore, it does not appear necessary to again dilate upon them here. Without, however, discussing all the factors which have been responsible for these defects and for the almost general falling off in quality, there are at least three of them which are worthy of special mention, and which require the serious consideration of most manufacturers of butter in this State. They are:—

1. Inefficient cream grading.
2. Contamination from wooden factory equipment.
3. The use of unnecessarily high pasteurising temperatures.

Inefficient Cream Grading.

The first essential necessary towards the manufacture of a high-class butter is undoubtedly to have good quality cream for treatment. Efficiency in cream grading is finally judged on the quality of the butter produced from the bulk cream in the vats, which has in turn been made up from a number of individual lots previously examined and graded. If the cream grader fails in his job of selecting proper cream for inclusion in the bulk from which it is desired to make choicest butter, all subsequent efforts to this end are nullified. During the present season observations by official butter graders, combined with the results of a number of biological examinations of inferior butter, indicate that at very many factories cream grading has not received the attention which its importance demands, and it has been evident that inferior cream has far too often been included in the vat containing choicest cream, with the consequent detrimental effect on the resultant butter.

The high standard of butter quality gradually attained during previous seasons admits of no slackening of effort on the part of factory managers if this standard is to be maintained. The tightening up of cream grading is at the present time one of the first essentials to this end, and it seems imperative that those responsible for the particular work in question should quickly realise the position, and grade the cream received in a manner conducive to placing the quality of the manufactured article above all other objectives.

* Paper read at the Conference of Dairy Factory Managers and Secretaries, Sydney, 1929.

Contamination from Wooden Factory Equipment.

There are at present throughout New South Wales factories many items of wooden equipment which have become from one cause or another definite sources of contamination, and it has again been fully demonstrated that where these conditions have existed the quality of the butter produced has suffered accordingly. Churns and workers have provided most of this contaminating influence. Some factory managers, when experiencing trouble with quality, and after having paid what they consider special attention to the cleansing of churns and workers, are at times loth to conclude that contamination from these sources is responsible for continued inferior quality. To these managers it is pointed out that there have been numbers of instances where the interior of a churn appears perfectly sanitary to the eyes and nostrils, but after being somewhat reluctantly discarded and dismantled has, on close inspection, revealed the presence of astonishingly insanitary conditions and consequent sources of contamination previously hidden from view, which no amount of cleansing and disinfecting could possibly have removed. This statement can be substantiated by officers of the field staff of the Dairy Branch, Department of Agriculture, and also, no doubt, by some of those present at this conference.

It should be realised that the life of a churn and worker is limited, and their term of usefulness and satisfactory sanitary condition is influenced to a great extent by their age and by the degree of care they receive. Sooner or later the wood from which they are made becomes soft and porous. Constant vibration and the weight of cream or butter bumping about in the churns for the long periods during which some of them are kept in commission have, in time, the effect of opening up the joints and loosening the bolts, thus allowing cream or butter to lodge in the openings made. It is impossible entirely to remove this cream and butter, which eventually becomes subjected to the action of bacteria, and an ever-present source of contamination is the result. Workers often become loose and develop cracks due to prolonged and constant use, and, when in this condition, they also constitute a definite menace to quality.

Equipment such as that above described should have no place in a butter factory, and should be scrapped. Constant care and attention are necessary from the time new churns are installed, otherwise they will soon become fat-saturated and contaminated. Intermittent cleansing is not satisfactory —the result of a week's neglect may have a far-reaching effect. This work must, therefore, be regularly, thoroughly, and methodically done. The use of the scrubbing brush and boiling water containing some good cleansing powder should be made absolute essentials for the purpose quoted. In many instances the worker does not receive the necessary attention in regard to cleansing; sometimes it is just placed in the churn and hot or warm water (often the latter) allowed to splash over it for a time as the churn revolves, instead of its being scrubbed and scalded with boiling water. The use of a neglected worker or one which is old and insanitary may often be the means

of nullifying any good results which might be anticipated when a new churn has been installed, or when a churn in a satisfactory, sanitary condition is in use.

The Use of Unnecessarily High Pasteurising Temperatures.

No good purpose is served by using unnecessarily high temperatures in pasteurising. There is always the possibility of producing a cooked flavour when temperatures above 185 degrees Fah. are used. Butter made from cream which has been heated to this extent has a tendency to be flat and lacking in true butter flavour, and especially has this been noted when the cream has been apparently neutralised to a fairly low acidity. There appears to be no need to heat to above a temperature range of from 183 to 185 degrees. During the course of investigations carried out from time to time by officers of the Biological Branch, Department of Agriculture, it has been demonstrated that this range is sufficient to give satisfactory results from a bacteriological standpoint, for observations during these investigations have frequently indicated that at 183 degrees Fah. a 99.9 per cent. reduction takes place in the bacterial content of cream as received at butter factories. When, however, temperatures below this figure have been used, say to 180 degrees, results concerning the destructive effect on germ life have not always given similar satisfaction. For this reason, therefore, 183 degrees is suggested as a safe minimum pasteurising temperature. Incorrect thermometers have at times been responsible for temperatures being used both below and above the range quoted, with a consequent bad effect on quality. This being so, factory managers should see that the thermometers in use are correct. Before being distributed the accuracy of one type of these instruments is checked by the Department on behalf of the dealers, but it is possible for them to get out of order through some structural defect or rough handling after leaving the Chemist's Branch of the Department, where this work is done. Two other types of thermometers are now frequently used in butter factories, namely, the Recording and the Dial. It is not possible to check the correctness of these at the Department's Chemical Laboratory, as this work has to be carried out under working conditions. For the reasons quoted, it is necessary to have a standard thermometer always on hand for checking purposes.

The main features adversely affecting the general standard of butter quality in New South Wales, which have been placed before the conference in this paper, are well within the power of the factory managers concerned to rectify; especially is this so regarding cream grading and the use of correct pasteurising temperatures, while the expense incurred by replacement of churns and other apparatus which have outlived their usefulness on account of age, or have become from other causes unfit for the purpose for which they are required, would be more than compensated for by the improved quality of the butter as a result of such replacements.

When these factors are adjusted satisfactorily, much will have been accomplished towards enabling New South Wales butter to retain the high reputation which it has enjoyed of late years.

The Influence of Feed on Health Preservation.

MAX HENRY, M.R.C.V.S., B.V.Sc., Chief Veterinary Surgeon.*

If a rapid survey of animal husbandry in this State is made it will probably be generally admitted that the greatest weakness is to be seen on the question of feeding. It has also to be admitted that the productivity of much of our country is diminishing, and that this decrease can be arrested and the pendulum forced in the other direction, simply by proper attention to the question of feeding. The productivity is decreasing because the stock are not in perfect health, and they are not in perfect health very largely because their feed is deficient or unsatisfactory. Moreover, even where there is no decrease in productivity, an improvement in health and a consequent increase in production is possible by the same means. There is no district in this State in which the carrying capacity and the productive value of the stock carried cannot be increased by attention to the food supply. There is urgent need that this State should concentrate on an increase in productivity of its live-stock. Such an increase can only be assured through the feed.

At the 1928 conference, when reviewing the situation as it existed in this State in respect of disease prevention, it was pointed out that sufficient attention was not being given to the prevention of disease by proper feeding. At the same time it was felt that the time had come when instead of stressing "the prevention of disease" we should rather stress "the preservation of health"—there may not be much difference but the latter is more embracing than the former, and undoubtedly takes the prevention further back.

Food Deficiency and Malnutrition.

Certain considerations on these questions were embodied in a circular addressed to District Veterinary Officers and Inspectors of Stock. It was pointed out that, too often, disease prevention was not sought until disease appeared, whereas health preservation stressed the idea of preventing disease appearing at all, and that such action was possible, more particularly in connection with diseases due to food deficiency and malnutrition, including all forms of food deficiency from actual starvation to the most obscure avitaminosis. The veterinary officers and inspectors were asked to consider this aspect of affairs very seriously. It was pointed out to them that the elimination of the diseases due to food deficiency or malnutrition, and still more the elimination of the tendency to these diseases, would result in a marked increase of production.

The officers concerned were asked to comment on the matter. The replies received were illuminating in more ways than one; they were depressing,

* Paper read before the Institute of Stock Inspectors, 1929.

and they were full of hope. This rather paradoxical result will be made clear if the reports received are considered somewhat in detail.

The depressing aspect of the replies is the frequency with which the reports commence by the statement that very little attention is given to the matter. The note of hope is to be found in the frequency with which this statement is followed by the quoting of examples in which individual owners have demonstrated to their own benefit and that of the State the splendid results that can be obtained when due attention is given to the matter.

As the District Veterinary Officer (South) points out, the question is intimately bound up with that of management. It is fairly safe to say that the idea of associating management directly with the preservation of health has received far too little attention, and yet if such an idea is aimed at, there will automatically result increased production. On the other hand, some measures which aim at increased production are by no means always beneficial to health. It has been suggested that the whole matter is so wrapped up with management that the average stockowner would resent any discussion of the subject. If that were unfortunately so, then an improvement in the health of our live-stock would be dubious indeed, because this is one of the most pressing problems facing us at the present time, and without discussion progress will be negligible. It is impossible to discuss any disease question without considering management as well; why should there be any particular objection to the discussion of nutritional disease?

The Value of Top-dressing Pastures.

Many of the officers reporting have drawn attention to the various methods by which this necessary increase in the food supplies for the stock can be brought about. Naturally enough at the present time, top-dressing occupies the first place, and in this regard it may be stated that every officer concerned with the health of live-stock appreciates the work of the Agrostologist and his officers on the agricultural side. Some officers appeared to think that nothing else was to be considered, but others have wisely noted that it is but one of many ways in which the desired end can be achieved.

On this subject Inspector Furness, of Bathurst, comments as follows:—"I have been pleased to note a strong and sure inclination of the stockowner to get information on the subject. Many of them are experimenting and the results are highly satisfactory. So much so that I recently reported to my Board: 'Top-dressing of pastures is coming into practice more and more. The results are so marked and highly profitable (particularly to the raiser of lambs for market) that it appears that before long it will be generally held to be essential to successful lamb-raising.'

"It acts as a wonderful stimulant to the growth of a greater variety of pasture. The owner gets probably a threefold amount of fodder, the animal gets all the essential elements required for its growth and is quicker growing, is more robust, and needless to say, healthier than it would be under natural conditions. Mr. J. Moad, Buyong, Millthorpe, showed me a paddock

carrying treble the number of sheep since he top-dressed, and the sheep were in wonderful condition, showing that they had received a big uplift when compared with sheep on similar country but untreated. He further showed me a paddock through which the drill had been driven in various directions in order to empty it of the remaining quantity of dressing left over from a cultivation paddock. The result of the treatment was most marked; the treated area had produced easily three times the growth of the untreated portions and, further, the growth of clovers was much greater.

"It has been my experience that stock that are deprived of the benefits of the spring herbage (through bad seasons) never seem to thrive as well during the summer months. This goes to prove that anything that will stimulate the growth of these nitrogenous, lime-loving plants, must be invaluable to the stockowner. One has only to see the experiment tried to be convinced that top-dressing of pasture spells heavier carrying capacity, healthier pasture, heavier and far healthier stock. Further, it is my experience that no matter how good the soil may appear, it is possible to get great value out of the use of certain artificial fertilisers. In some instances the results obtained have been remarkable."

Instances of the fine results obtained from top-dressing are also quoted from Bombala, Cooma, and, of course, Goulburn, where the results obtained on "Gundowringa" are outstanding. Inspector Forster draws the natural conclusion that "Gundowringa" has departed from the too common practice of waiting until disease has appeared through lack of feed before taking steps to deal with it. If disease due to lack of feed is to be prevented, then action is required constantly and particularly in times of plenty. If prevention is left until disease appears, then loss must be more or less heavy. Inspector Forster stresses the idea that pasture improvement should be the main consideration in all closer settlement schemes. He considers it the main chance of men starting on small areas of present high-priced grazing land, and that it offers a more secure return from grazing better class country than farming any distance away from markets. There is much that is sound behind this contention, and undoubtedly pasture improvement must be considered a great factor in bringing about closer settlement in the inside country.

Another advantage of top-dressing, of course, is the effect on the carrying capacity. In the past, if a stockowner wished to increase the number of healthy stock he was carrying it was necessary for him to acquire more land. Now, by increasing the supply of feed, particularly by pasture improvement, he can double or treble the number of stock he carries, often at a lower cost than by the purchase of additional lands.

Lucerne and Silage.

Second to pasture improvement comes, perhaps, the supply of lucerne, so valuable a food in the prevention of disease because of its richness in lime and nitrogen and general high-feeding qualities. The use of lucerne is

spreading equally with the practice of pasture improvement. Inspector Nevell, of Braidwood, points out that in the western portion of his district good lucerne is growing where a few years ago no one would have thought of growing the crop. This appears to be the experience in many places, and the beneficial effect of a judicious ration of lucerne on the health of all classes of stock cannot fail to have been noted by anyone with experience of it.

Possibly next in importance comes the provision of silage. Comment is made in more than a few reports on the primitive and wasteful methods so often employed in the feeding of maize and sorghum. Inspector Rees, of Moss Vale, draws attention to an instance in which these primitive and wasteful methods were ended by the putting in of a 100-ton silo. The silage so stored provides the basis of a mixed fodder for three months, and maintains milk production during the worst three months of the year. The drudgery of the old method is cut out, nothing is wasted, and the health of the stock is maintained.

This comment brings forward one of the main considerations regarding silage. Its use enables cows to commence their period of production in good health. The cow that is starved through the winter is predisposed to many diseases, and not being in the full flush of health (no starved or semi-starved animal is) cannot produce to its maximum capacity.

Overstocking and Other Evils.

The subdivision of paddocks, with its natural corollary of spelling, has an intimate bearing on the health of livestock. The tendency naturally is for stock to concentrate on the more palatable and nutritious grasses and plants. Spelling gives these plants an opportunity to maintain themselves. Stock, when put back into a spelled paddock, will gain in health through the greater abundance of such growth. The paddock spelled is relieved for a time from continuous trampling, a certain amount of humus collects instead of being blown away, and the land freshens. All this has a subsequent beneficial effect on health.

A matter which is not unassociated with the subdividing and spelling of paddocks, and one which has always been somewhat of a bugbear in this country, is overstocking. The deplorable results of overstocking on health are too obvious to require any stressing, and are simply due to food deficiency, a deficiency which may be of quantity or quality, but which is usually of both.

Many Inspectors draw attention to the evil effect of overstocking and to its prevalence, as well as to the gain which judicious stocking can bring about. The following notes are quoted :—

"Native grasses disappeared through overstocking and drought."

"More judicious stocking and subdivision of paddocks would improve the quantity and quality of the pastures in most of the districts, and it would follow that stock would be better fed and in better condition to withstand disease."

"As regards this district I consider the most important factor should be the prevention of overstocking."

"Stockowners can materially help [*i.e.*, to prevent disease] by refraining from overstocking their country."

"There are owners in this district who are always somewhat overstocked. This overstocking is quite apparent in the stock. They will be found smaller, cutting less wool, not carrying the same condition, and lacking that fine, fresh, well-fed appearance which stock should have if in good health."

"This district is suffering from overstocking in a great many cases."

On this point the District Veterinary Officer (West) is very emphatic. He says: "Most of the Inspectors have referred to overstocking as being responsible for reducing the quantity and quality of the feed. This, in my opinion, is one of the chief reasons for depletion of pastures, and has been previously referred to by me in a paper entitled 'The Diet of Sheep in Western New South Wales,' read before the Animal Husbandry Conference in Sydney in 1926. Much of the overstocking has been due to ignorance, but a certain amount is due to the fact that owners have suffered heavily from drought, and in order to recoup their losses have overstocked their country during a medium season, with disastrous results. In certain good seasons in the west it is practically impossible to overstock, providing the heavy stocking does not continue after the herbage has dried off."

Overstocking is, of course, a relative term. It will be quite possible to find two properties on similar country, one carrying five sheep to the acre and the other one, and the property carrying one sheep would be the one overstocked. In this connection it may be noted that so far as the eastern half of the State is concerned the term that such and such land is one-sheep-to-the-acre land, and so on, will rapidly become obsolete, because the carrying capacity will vary so enormously with the state of real improvement to which the land has been subjected. The "improvements" of land in the past have been ringing, clearing, and fencing, &c. The "improvements" of the future will include top-dressing, laying down of Subterranean clover, planting of lucerne, and so on.

A matter which is of considerable importance to the food supply of some districts, and to which Inspector O'Neill, of Condobolin, especially draws attention, is the breaking up of scalded plains and the sowing of grasses thereon. In the aggregate there is a good deal of country in the central-west which requires such treatment. When rabbit burrows are being broken up by ploughing in, a good opportunity also occurs of increasing the food supply by sowing seed in the disturbed soil.

So long as rabbits are present in large numbers on the lands used for grazing stock, they will constitute one cause of ill-health in stock, not as is often assumed because of anything intrinsic to the rabbit, but simply by bringing about a state of food deficiency for other animals. This view is shared by the District Veterinary Officer (North), who states: "

carrying capacity of country and the subsequent health of live-stock is also largely influenced by the presence or otherwise of vermin, such as rabbits. This is merely one aspect of the stocking of the country." Therefore, the netting and subdivision of properties and the destruction of rabbits thereon is to be regarded as being essentially part of the work of disease prevention.

As regards young stock, it is no secret that the effects of malnutrition are widespread, particularly amongst pigs and calves. The under-feeding of these animals is stressed by Inspector Devlin, of Casino. If an animal is stunted by underfeeding in its youth, is it to be expected that it will grow up into a flourishing disease-resisting animal ?

On the question of the nutritional diseases of pigs, the District Veterinary Officer (South) suggests that the restricted diet and lack of green food from which the coastal pig often suffers, is the main cause of the amount of such disease present. It has appeared to him that the Murrumbidgee and Tumut River pigs are better developed and less liable to such diseases, and that this may be due to the fact that these pigs are widely grazed on lucerne and natural grasses.

Depletion of the Mineral Content of the Soil.

So far the question of actual food has been under contemplation, but it is desired to comment more particularly on one class of food material, and that is the mineral matters. Of the results of the deficiency of mineral matter in the food in this country there can be no question. Most of the coastal Inspectors draw attention to it, and to the fact that much of our country is going back as a result of the continuous grazing and of the failure to replace what is taken out of the land. On the process of deterioration which is taking place, Inspector Fielder, of Armidale, reported : "Your remarks regarding disease due to feed deficiency in the soil are in accord with an opinion which I have had for some years as the result of careful observation and noting of statements made concerning the present carrying capacity of areas when compared with that of thirty years ago or longer. Old sheep-breeders in this district can relate of the great numbers of sheep which they were able to graze successfully on areas which to-day will only graze two-thirds of that number. Contemplating the conditions of this district over thirty years ago, which is beyond my experience, it is reasonable to assume that one would have found perhaps half, probably less, of the holdings improved by ring-barking, the balance being, in the majority of instances, green timbered and yet able to carry more stock than is the case to-day. In seeking for causes I must here avail myself of the opportunity of recording my strong protest against what is called 'highly improving' grazing land by the general denudation of green timber. This, in my opinion, constitutes the leading cause of a decreased carrying capacity of land. This will be generally realised [illegible] in the next twenty years, and sylviculture will be adopted. Note the wo[illegible]t of 'ringing out' heavily timbered good sheep country. Provided normal seasons prevail and the area is not overstocked, the feed increases, we

will say, to abundance. After ten years the timber is stacked, burnt off, and the area cleared. Between fifteen and twenty years after being ring-barked, during which period the area has been continually grazed, indications of a falling off in the body of the feed occur, and the grazing capacity during normal years from reaching a state of abundance now commences to gradually diminish. Only by giving the area a good spell to allow for seeding, a practice by no means general among graziers, can the pastures recover temporarily.

"Reverting to the subject of 'ringing out' country. At first the new country is rich in natural manurial elements acquired from decaying vegetable matter in the leaves, bark and wood. As the area is opened up and grazed over, these elements gradually become consumed or removed by rains, winds and grasses, over a period of fifteen to twenty years, perhaps longer. Only in gullies, where this humus has accumulated for centuries will its effect be retained and indicated by a luxuriant growth of feed. The hills in summer produce a short shoot, which, unable to survive the heat and winds, burns off, leaving bare slopes, because these 'highly improved' ridges have lost the natural fertilising agents provided by decaying vegetable matter from the timber. My observations have proved to me that the grasses are much superior on country on which the timber (dead) is left to rot and thus provide a manurial agent, than on country where the timber has been burnt off.

"Returning to the carrying capacity of the land which, it is claimed, would thirty or forty years ago graze a greater number of sheep than is possible to-day, there is one aspect of this matter which has been very probably overlooked. It is commonly known that the average merino wether cuts from 5 to 5½ lb. wool. To-day, through the development of improved types and a careful selection of rams, the average wether will cut 10 lb. or more. From our knowledge of sheep and wool, it is recognised that the sheep producing the modern fleece requires more or an improved feed to the old type producing 5 lb. Consequently, country which carried 1,000 sheep of the old type thirty-five years ago is only capable of grazing 750 of modern type. Although the carrying capacity has decreased, the wool product per sheep has doubled during the last thirty-five years. The result of this increased wool product must be an increased demand on the soil. The manurial elements passed from the animal are incapable of compensating the soil for the mineral food extracted through grazing, and as a sequence the soil for the most part is gradually denuded of its natural fertiliser, and, after years of grazing, produces feed which is deficient in the essential mineral ingredients necessary to produce or sustain healthy animal life; consequently the animal becomes prone to disease.

"To combat disease by the preservation of health or to win back a general healthy condition of our flocks is, undoubtedly, only to be attained by returning to the soil that which we have for years been extracting in producing wool and carcase. I predict that the era is not far distant when pastoralists in general will recognise the necessity of cultivation as the direct means of

preserving the health of stock. Messrs. Gatenby and Horsfall, of the Forbes district, proved this during the 1902 drought by obtaining remarkably favourable results with sheep on cultivated areas assisted by irrigation. Regarding this practice, Messrs. H. White, of "Bald Blair," and L. Dutton, of "Urandangie," Guyra, have for years adopted the scheme of cultivating grazing areas. The condition of their stock and holdings should convert the most prejudiced person."

Even the Richest Soils Become Depleted.

In some districts which have been more recently developed the truth of this will not be recognised. Those districts are approaching or are at the peak; they are still living on the reserves of food material stored up in the soil through unknown periods of time, during which the demand on the soil was practically nil. When that reserve becomes exhausted they will begin to go downhill and the result will be malnutrition and ill-health in the stock. The thing is a mathematical certainty. The length of time before such a tendency is exhibited will depend on the original richness of the soil.

On this point the District Veterinary Officer (North) observes that "cases constantly come under notice where even alluvial soils, ordinarily rich in all plant-foods and minerals have, owing to long periods of cultivation and grazing without any attempt being made to carry out manuring, become poor in certain food plants and definitely deficient in minerals."

Now is the time to take action in districts which are not yet suffering. By doing so a vast amount of future disease will be prevented. As regards those districts which are already on the down grade, steady and constant work will be necessary to bring them back to such a level that they will satisfactorily maintain healthy stock.

This mineral deficiency is widely noticeable, and is by no means confined to the coast. It is perhaps less apparent in many of the wheat districts than elsewhere because, as the District Veterinary Officer (South) and Inspector Hildred point out, the manuring of crops is not without some residual value. The District Veterinary Officer records having removed two bone-chewing cows out of the paddock they were in, into a paddock which had been manured and cultivated, and they quickly lost the desire for bone-chewing.

It will be contended, no doubt, that the financial standing of the individual often prevents any of the actions suggested being undertaken. That may be perfectly correct, but the question is being looked at for the time being from the national viewpoint. It may well be that the question is not so much that the individual cannot afford to do this work of preventing disease through feed, but whether the State can afford not to have it done.

It is necessary to bear in mind that the changes in management which the provision of a more ample food supply will entail will react on the stock. Whilst much will be done to improve health, constant observation will be necessary to combat conditions such as plethoric toxæmia, which appears to be associated with plentiful feed. Stock generally will require more supervision and more control, a deeper knowledge of the principles governing

sound animal husbandry will be required, and an approximation to some of the methods employed in older countries. These facts, however, are not in any way valid reasons for suggesting that the main object outlined here, *i.e.*, preservation of health through the feed, can be neglected. This is all the more necessary to-day because owners nowadays cannot afford to lose stock from disease or to have them produce below the maximum. The old days when the loss of a few head did not matter, and when an animal sick in any way was best knocked on the head, have passed completely away, but a great many people have not yet lost the mental attitude which went with those days and which is now an anachronism.

TUBERCLE-FREE HERDS.

OF the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number tested.	Expiry date of this Certification.
P. F. Mooney, Calala	33	16 July, 1929
Sacred Heart Convent, Bowral	10	21 ,, 1929
Dominican Convent, Moss Vale	4	26 ,, 1929
St. Patrick's College, Goulburn	8	26 ,, 1929
Presbyterian Ladies' College, Goulburn	4	26 ,, 1929
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	42	9 Aug., 1929
Kyong School, Moss Vale	2	21 ,, 1929
Department of Education, Mittagong Farm Homes	34	23 ,, 1929
Blessed Chanel's Seminary, Mittagong	4	25 ,, 1929
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	75	25 ,, 1929
Walaroi College, Orange	5	30 ,, 1929
Riverstone Meat Co., Riverstone Meat Works, Riverstone	121	5 Sept., 1929
J. L. W. Barton, Wallerawang	22	11 Oct., 1929
W. McLean, Unanderra	44	1 Dec., 1929
Department of Education, Brush Farm, Eastwood	8	5 ,, 1929
Lunacy Department, Morisset Mental Hospital	21	7 ,, 1929
J. Davies, Puen Buen, Scone (Jerseys)	39	12 ,, 1929
Kinross Bros., Minnamurra, Inverell (Guernseys)	73	14 ,, 1929
Lunacy Department, Callan Park Mental Hospital	22	19 ,, 1929
Miss Brennan, Arrankamp, Bowral	14	20 ,, 1929
E. S. Cameron, Big Plain, Narrandera	39	10 Jan., 1930
A. Shaw, Barrington	36	11 ,, 1930
Lunacy Department, Rydalmere Mental Hospital	68	11 ,, 1930
G. A. Parrish, Jerseyland, Berry	77	12 ,, 1930
New England Girls' Grammar School, Armidale	23	16 ,, 1930
G. Miller, Casula	15	1 Feb., 1930
Queanbeyan Municipality (various owners)	41	1 ,, 1930
St. Joseph's Convent, Reynold-street, Goulburn	5	19 ,, 1930
St. John's Boys Orphanage, Goulburn	9	19 ,, 1930
St. Michael's Novitiate, Goulburn	5	20 ,, 1930
Department of Education, Yanco Agricultural High School	32	23 ,, 1930
Lunacy Department, Kenmore Mental Hospital	81	28 ,, 1930
St. Joseph's Girls' Orphanage, Kenmore	9	1 Mar., 1930
Tudor House School, Moss Vale	8	6 ,, 1930
Department of Education, Hurlstone Agricultural High School	42	10 April, 1930
Navua Ltd., Grose Wold, via Richmond (Jerseys)	10	11 ,, 1930
Australian Missionary College, Cooranbong	48	17 ,, 1930
Department of Education, Gosford Farm Homes	37	24 May, 1930
William Thompson, Masonic School, Baulkham Hills	27	24 ,, 1930
F. W. Hopley, Leeton	29	29 ,, 1930
J. F. Chaffey, Glen Innes (Ayrshires)	54	29 ,, 1930
P. Ubrihien, Corridgeree, Bega	119	8 June, 1930
E. P. Perry, Nundorah, Parkville (Guernseys)	28	14 ,, 1930

—MAX HENRY, Chief Veterinary Surgeon.

Vaginitis and Sterility in Cattle.

W. L. HINDMARSH, B.V.Sc., M.R.C.V.S., D.V.H., Senior Veterinary Research Officer

SEVERAL reports regarding the failure of cattle to breed regularly have been received at Glenfield Veterinary Research Station during the past few months. This is an indication that sterility (temporary or permanent) is assuming an increasing importance and is a cause of serious loss to the dairy-farmer. Investigations carried out by the writer when District Veterinary Officer (North) showed that almost all breeders of dairy cattle had cows that returned to the bull two, three, four, or more times before they conceived, and some failed to conceive at all. As many as 30 per cent. of the cattle on some farms required two or more services before they proved to be in calf, and in one case no cattle in a herd of sixty had proved in calf in a period of six months. The losses sustained by this failure to breed regularly may be stated as follows:—

(*a*) Cattle are kept on the farm when they are producing no return.

(*b*) Not having the milk supply at the time desired, the farmer is unable to make the most of the market for which he produces.

(*c*) Time is lost in treatment, and money often spent in what is useless treatment.

(*d*) The farmer is compelled to dispose of animals of good milking strain at butchers' prices.

(*e*) The farmer is unable to breed from cows of good milking strain whose progeny he desires to keep. In the case of pedigreed cattle this is of major importance.

Infections of the Vagina Prevent Conception.

Although sterility may be due to a number of causes, such as disease of the ovaries and womb, or impotency of the bull, clinical evidence collected in the field indicates that infections of the vagina play an important part in preventing conception. The vagina is the posterior part of the genital tract, *i.e.*, that which receives the male organ during service. It is readily accessible to manual interference, and thus dirt and infective material readily gain entrance to it. It cannot be stressed too strongly that the lining membrane of the vagina is a most delicate structure, and for conception to take place it must be in a healthy state.

Since the semen is deposited in the vagina during service, and the sperms are easily destroyed by unfavourable conditions or influences, one is justified in assuming that any departure of the vagina from normal must be regarded as serious. This assumption is supported by the results of examination of cattle that have returned to the bull on several occasions, since the only departure from normal that could be detected in a large percentage of cattle examined was found in the vagina. Further treatment directed solely towards alleviating the vaginal inflammation resulted in many cattle being impregnated by the bull.

Classification of Different Forms of Vaginitis.

Vaginitis may be found in many forms in cattle, and these may be classified as follows:—

1. *Purulent Vaginitis.*—This frequently results from infection gained during prolonged calving, from retained afterbirth, or from abortion. It is usually associated with infection of the womb, and is indicated commonly by a thick, copious, often foetid, discharge. Sometimes the actual discharge from the vulva is not very marked, but a large amount of pus may be found collected in the deeper part of the vagina and in the womb. Generally speaking, the treatment of these cases is not successful in the hands of the farmer, and when the womb is involved the disease calls for skilled and specialised methods.

2. *Congestion of the Vagina.*—In this form of vaginitis the wall of the vagina is more or less diffusely reddened, and there may be a small amount of thick sticky material adhering to the inner lining of the passage. This condition is readily produced by the injection of disinfectant that is in too strong a solution and very irritant. Any strong solution of disinfectant may produce it, and the mercurial compounds are especially dangerous. In many cases, however, field investigations favour the opinion that it may be due to an infection, and be carried by the bull. One can realise, therefore, that the aim should be to treat all cases of vaginitis, and if possible not to allow affected cows to go to service. Particular care should be taken to see that cows which show a discharge from the vagina are not sent to the bull.

3. *Granular Venereal Disease (Granular Vaginitis).*—This disease is undoubtedly the most widely spread infection of the vagina of our dairy cattle. It occurs in all countries of the world, and scientists are divided in opinion as to its cause and significance. In our opinion, however, there is no question but that it is to be regarded as an actual disease condition and treated as such. That it is frequently related to the presence of sterility is borne out by the fact that many affected cattle—suffering from no other complaint of the genital system—which have returned to the bull several times without conceiving will breed after treatment. This disease may often be seen in young stock, calves three weeks old having been found affected. It becomes more intense during heat, and bulls may become infected and in turn infect other cows.

In examining an infected cow it will usually be found that the tuft of hairs at the lower part of the vulva is matted together with a glutinous discharge. This may be the only evidence that there is any discharge. When the disease is in acute stage—especially during heat—a white sticky material may be found in the vagina, but frequently there is little discharge to be found. On opening the passage with the fingers and letting the light shine on the lining membrane, little nodules may be seen. These are one-tenth of an inch or less in diameter. They are frequently arranged in rows, and may be confluent. In early acute stages they are red in colour, but as the condition becomes chronic the colour may vary from pale pink to yellowish. The membrane of the passage in acute cases is moist and

oedematous, but in chronic cases it is rather dry and thickened. These tiny nodules are usually grouped in the lower part of the vagina about one inch from the opening, but in severe cases they are widely spread over the vaginal surface.

Douching is Beneficial, but not a Cure.

No treatment (which will completely cure the disease) has yet been discovered. Treatment, however, can lessen the acute manifestations of vaginitis to such an extent as to permit of successful service. Mr. A. L. Rose, V.B.Sc., now District Veterinary Officer, Cootamundra, reported on some cases seen by him and treated. Of eight cows that had consistently failed to breed all conceived after douching. In this case treatment consisted of—(*a*) syringing out the vagina daily with 0.5 per cent. potassium permanganate until the animals showed heat, and (*b*) syringing out the vagina with a weak solution of salt and water before putting the animal to the bull.

Generally speaking, any very weak solution of disinfectant may be used for the douche, provided that it is *weak*. Strong solutions will increase the inflammation. One per cent. of any disinfectant, such as lysol, has given as good results as potassium permanganate. Soda solution (one tablespoonful of baking soda to one gallon of water) may be used just prior to service instead of salt solution, if desired.

Some farmers who have adopted this treatment for cows temporarily sterile have been so satisfied with the results that they make it a routine treatment for all their cows. By this means they have considerably lessened the number of services required for conception.

It must be borne in mind that all cows suffering from granular venereal disease do not fail to breed, but when the disease is prevalent in a herd a percentage of cattle will constantly return to the bull.

Experiments are in progress at the Veterinary Research Station and in the field in an endeavour to evolve a treatment which will cure this condition.

A second article on sterility, but from a different point of view, will appear in next month's *Agricultural Gazette.*

THE NEWLY-FORMED IMPERIAL BUREAU OF SOIL SCIENCE.

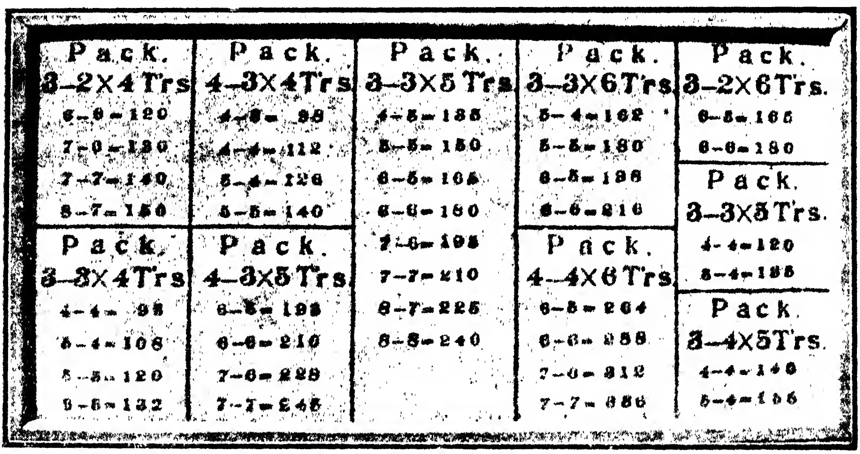
THE Imperial Bureau of Soil Science (one of the eight bureaux, the formation of which was recommended by the Imperial Agricultural Research Conference of 1927), commenced work in May at Rothamsted Experimental Station, England.

Before long the Bureau hopes to be in close touch with all soil investigators of the Empire, both at home and abroad, and that by means of information circulars and other methods, the results of studies carried on in one part of the Empire will be made available for all. Arrangements are also being made to supply information dealing with soil investigations in foreign countries, the results of which (owing to language or other difficulties) are not now readily available.

A Wall Chart for Packing Sheds.

W. M. WALKER, Orchardist, Glen Innes Experiment Farm.

In large packing sheds where several packers are employed they are usually experienced men whose whole time is given to packing. If the shed is well run each packer will be kept on one or two sizes and he will experience no trouble in remembering the different packs or counts of the particular size or sizes he is packing. In smaller sheds where only two or three are employed to carry out the whole of the operations of an orchard, partly giving their time to picking, packing, nailing down, carting, &c., changing over from one variety to another and remembering the different packs and counts becomes more or less confusing. In such cases a wall chart similar to the one used in the packing shed at Glen Innes Experiment Farm (see accompanying illustration) will be found most useful, especially to those who mark the packed cases with the numbers they contain.



Wall Chart for Packing Shed.

A free Departmental leaflet, "A.B.C. of Apple Packing," explains in detail the methods of packing recommended by the Department of Agriculture, and sets out the difficulties which arise in obtaining the desired height when using differently shaped apples. To show on the wall chart full details, such as "on flat," "on edge," "open," "closed," the approximate size, &c., in letters and numerals large enough to be legible from a packing table or sizer would necessitate too large a board, while the greater area to be perused to ascertain the count of the pack desired would require more time.

Assuming the packer has some knowledge of the different packs, the wall chart is merely to enable him to ascertain at a glance the number of apples the case contains, according to the pack he has used. The particu-

lars on the wall chart illustrated were obtained by taking a note of the different packs, tiers and counts, and the total counts necessary to pack on edge and flat in the Canadian case the main varieties grown at Glen Innes Experiment Farm orchard, which are: Jonathan, Cleopatra, London Pippin, Dunn's, Buncombe, Delicious, Granny Smith and Stone Pippin, ranging in sizes from 2⅝ to 3½ inches. This information was then lettered on a board 3ft. by 6ft., which is hung on the wall where it may be readily seen from both sides of the sizer. The board was constructed of three-ply fitted into a frame of 1½ by 1 inch material.

The word "Pack," and the letters and figures indicating the number of tiers and the pack are 1⅝ inches high, while the row counts and total counts are in 1 inch figures. The former, being much the larger, are readily discerned from the others, and both are quite legible at a distance of 36 feet. The packs with their row counts and total counts are separated from each other by a thick black line which aids the packer to ascertain the count required with more rapidity.

It is not claimed that this particular chart can be used in every packing shed, as, plainly, it would have to be altered according to the shape of the apples being packed, and this may vary in different districts. It should be an easy matter, however, to follow out the idea and draw up a chart to suit local conditions.

Infectious Diseases Reported in June.

The following outbreaks of the more important infectious diseases were reported during the month of June, 1929:—

Anthrax ...	Nil.
Blackleg ...	12
Piroplasmosis (tick fever) ...	Nil.
Pleuro-pneumonia contagiosa ...	9
Swine fever ...	Nil.
Contagious pneumonia ...	Nil.

—Max Henry, Chief Veterinary Surgeon

Pure Water for Dairy Cows.

According to *Dun's International Review*, the owner of a cow which produced 10,584 lb. milk and 542·6 lb. of butter-fat last year, was asked: "What is the cheapest and best form of food for dairy cows"? "Pure water," he replied, "only be sure that the water is put in the cow and not in the milk can."

Milk is approximately 87 per cent. water, and if the cow does not have access to an unlimited supply of fresh, clean, palatable water, her milk flow is bound to suffer heavily. A high producing cow will consume from 25 to 30 gallons of water per day. A reliable automatic water supply system has proved to be one of the most valuable items of a dairy farm's equipment.

Orchard Notes.

August.

C. G. SAVAGE and H. BROADFOOT.

Growers who have not yet completed their ploughing should do all in their power to finish this important work as soon as possible. Early winter ploughing is strongly recommended, as the land is then put in the best condition possible to absorb winter rain, the soil is exposed to the beneficial influences of frost, and the decomposition of vegetable matter ploughed in is completely accomplished. It is impossible to forecast what the season is going to be, and if the ploughing is delayed until the spring there is every likelihood that the trees and the crop will be prejudicially affected.

Manuring.

For the benefit of growers of oranges and mandarins who have in the past used applications of mixed fertilisers, it may be stated that it is believed that an application of nitrogen alone is the most economical, at least for several seasons. For young bearing trees, up to 1 lb. of nitrogen (5 lb. sulphate of ammonia) per tree should be used; trees in full bearing should receive up to 2 lb. nitrogen. For orchards that have received practically no manure in the past a mixture of 6 cwt. sulphate of ammonia, 3 cwt. superphosphate, and 1½ cwt. sulphate of potash is recommended, applied at the rate of 1 lb. per tree for each year of the tree's age. Thus, a ten-year-old tree would receive 10 lb. of the mixture. Even in cases where resoiling is carried out, application of a fertiliser with a high nitrogen content is desirable.

Where the winter rainfall is at times heavy, the sulphate of ammonia or mixed fertiliser mentioned should be divided into two or three applications; half at least should be applied just prior to bud burst, and the balance about two months and four months later. In districts of low rainfall, where drainage is retarded, but where irrigation is possible, the application may be made in one dressing, which should afterwards be cultivated into the ground.

Lemon trees, which produce chiefly a main crop, may be manured similarly to oranges, but a greater proportion of fruit can be induced to ripen during the spring and summer if the main application is made about the end of October, followed by reduced amounts in December and early February.

Planting.

The planting of deciduous trees may be continued this month, but earlier planting is always desirable, as a tree placed in its permanent position is making root development long before it commences to shoot in spring, and it is important that such root development should take place some time before top growth makes its demands.

In localities where late frosts are likely to be experienced it is better to defer planting until any danger from frost is over.

Grafting.

Grafting may be carried out in many districts toward the end of this month. Any undesirable varieties of trees should be grafted with desirable varieties. Grafting wood should be selected from trees which have produced good crops of good quality fruit. A bulletin on budding and grafting may be obtained on application to the Department, price 10d., post free.

Pests and Diseases.

Cherry and peach trees which are infested with aphis should receive an application of spray oil as late as possible before the buds burst in spring. A good force is necessary to break up the aphis clusters, and the spraying must be thoroughly done. It may be necessary to follow with an application of nicotine extract after the trees commence to shoot. If this pest is not kept in check it will do a considerable amount of damage. Aphides not only interfere with the current year's crop, but also with that of the year following.

A close watch should be kept for San José scale. There is still time to spray any infested trees which have not yet commenced to shoot. Miscible oil has proved the most efficacious spray for keeping the pest in check.

Powdery mildew is very much in evidence in many of the chief apple-growing districts, particularly in such varieties as Jonathan and Sturmer. When pruning, it is advisable to remove and destroy by burning all infected twigs. This precaution and spraying later with colloidal, atomised or dritomic sulphur are the only completely satisfactory means of keeping this disease in check. A leaflet on this subject is obtainable free from the Department.

Pruning.

This operation may be continued during the current month, particularly in late districts, but an endeavour should be made to complete the work as soon as possible. In the case of old bearing trees the characteristics of each variety should be studied, and it should be remembered that each tree of the same variety has a sort of individuality which cannot be profitably ignored. In the case of young trees the establishment of a good framework is of great importance; they should not be allowed to outgrow their strength or to commence cropping before the limbs can bear the weight of fruit. Only by giving close attention to the individuality of each tree and treating it accordingly can the best results be obtained.

Marketing of Citrus Fruit.

The marketing of citrus fruits is in full swing, and growers would be well advised to see that the many operations in this connection are carefully carried out. The following are some of the most important phases of work to be observed by growers when preparing fruit for market.

Grading for Size.

The advent of the mechanical fruit grader has made easy the work of grading fruit to size. There are many such machines on the market to suit the large or the small grower, and they certainly do the work more quickly and more accurately than it could be done by hand and eye sizing. Hand sizing is slow, costly, and, generally speaking, unsatisfactory. Machine sizing by comparison is quick, accurate, and cheap. Growers who have not yet purchased a sizing machine should do so as soon as possible. Such a machine is of considerable assistance to packers. By its help they can pack more expeditiously and more satisfactorily, for that good packing depends chiefly upon good sizing needs no demonstration.

Grading for Quality.

Grading for quality is of great importance—it is just as important to separate clean from slightly blemished fruit, and slightly blemished fruit from fruit carrying larger blemishes as it is to size the fruit. All fruit in the various grades should be as nearly as possible equal in size, appearance, quality, and maturity.

Packers.

Special packers are often engaged in very large orchards. They should, of course, be thoroughly competent and should carry out their work conscientiously, but the orchardist must exercise the most careful supervision, and since one or two careless men may involve him in serious loss, such packers should be got rid of. Unsatisfactory packing sometimes results from too great speed, and this is at times a consequence of piece-work and of rivalry. Some packers are naturally quick and neat, and others not so skilful try to equal them in their tally with detriment to the grower's interests. It needs no argument to show that it is better for the grower to have his fruit packed well at a reasonably moderate rate than to have it packed very speedily—and carelessly.

The production of fruit is a costly, arduous, and uncertain business. There are many factors entirely beyond the grower's control, but when good fruit is produced it must be the orchardist's care to see that the profits from it are not reduced by slovenliness in packing.

Packers should always keep their finger nails short, otherwise damage will be done to the fruit by puncturing of its skin.

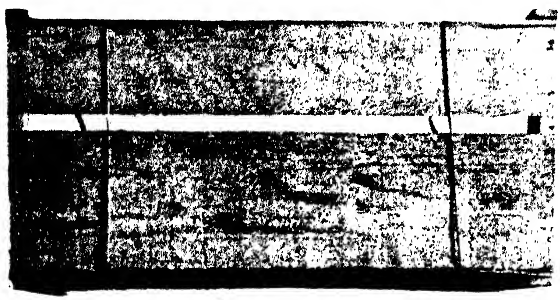
Cases.

A well constructed case is essential—it would be hard to estimate the loss of fruit due to faulty case construction. Cases are often made of unseasoned wood, and such cases necessarily suffer from shrinkage of the timber. They are, too, often constructed of very flimsy wood, and the timber used for the sides is often as thin as that used for the tops and bottoms; consequently when the fruit is packed the sides bulge, with resultant damage to the contained fruit when the cases are stacked. Sometimes, again, cases

are constructed with too much space between the boards, and the skin of the fruit resting on the edges of the separated boards is broken and the fruit laid open to attack by the germs of decay. Decomposition then takes place, and quickly spreads to other fruit in the case.

Length and Gauge of Nails.

Many growers who buy timber in shooks and make the cases do not use nails of sufficient length or gauge, and consequently the nails draw out under the slightest pressure, causing a board or side of the case to fall



A Badly Wired Case.

The wires are too far from the ends; there is also too much space between the boards on the sides, and there is no bulge on the top and bottom.

A Case Correctly Wired.

Showing a bulge on the top and bottom. If a two-piece side is used, the space between the boards should not be more than $\frac{1}{16}$ inch.

away, and resulting in the spilling and damaging of the contents. After the cases have been wired there is no danger of the boards becoming loose or falling away, but this often happens while the cases are being handled before wiring.

The length and gauge of nail to use will depend on the class of timber which is being used for the making of the cases. For the softwood bushel case $1\frac{1}{2}$-inch 15 gauge should be used for nailing across the grain and $1\frac{3}{4}$-inch 14 gauge for nailing with the grain. For the hardwood bushel case $1\frac{1}{2}$-inch 14 gauge are best for driving across the grain of the wood, and $1\frac{3}{4}$-inch 14 gauge for nailing with the grain, while $1\frac{1}{4}$-inch 15 gauge are also useful.

Wiring.

The wiring of cases is highly desirable. There are a good many machines on the market which do the wiring quickly and effectively. Two wires are placed round each box about 1¾ inches from each end. The wiring adds stability to the box and there is less likelihood of breakages occurring and less danger of the contents being pilfered.

Nailing and Nail Strippers.

Provision for the springing of the tops and bottoms of the case should be made while the lid is being brought into place for nailing. Undoubtedly this is best done in a press. The box rests on the thickness of its end only, leaving the remainder of the bottom free; the clamps of the press only bear on the ends of the lid, and when the pressure brings the ends of the lid down to their place, both the top and bottom are free to spring or bulge. Nailing is then carried out while the press holds the ends of the lid firmly in their place. If a press is not used, one or both ends of the case should rest on battens, so as to leave the bottom free to spring while the top is being nailed down.

Strippers are invaluable to the nailer whether he is making cases or nailing down packed fruit.

Gravity Conveyors.

No large shed is complete in equipment without the use of gravity conveyors. They eliminate handling, and fruit can be carried to any part of the shed carefully and expeditiously.

Stencilling, Labelling, and Stacking.

Under the existing grading regulations fruit cases must bear, when packed, certain specified marks. Growers who use a stencil should see that the stencilling is well done and is readily decipherable—indistinct and carelessly put on marks retard the sale of fruit. During the past few years labels have largely taken the place of stencillings, and in many instances are so attractively designed and coloured that they enhance the appearance of the case.

When cases are being stacked, great care must be taken not to stack them on the bulge, but on their sides. If stacked on the bulge a considerable amount of bruising of the fruit is likely to occur, with consequent loss to the grower. Men engaged loading fruit should be instructed not to walk on the cases. Trucks should be swept clean before fruit is loaded into them.

Fur Farming in Canada.

According to the Canadian Bureau of Statistics, fur farming in that country has long since passed beyond the experimental stage, and is now an established and important industry. At the end of 1927, there were 3,380 fur farms in the Dominion, an increase of 671 over the preceding year. The total property value of these farms, including the fur-bearing animals, is placed at £3,671,000, an increase of about £680,000, or 23 per cent. over the previous year.

Poultry Notes.

AUGUST.

E. HADLINGTON, Poultry Expert.

DURING the past spring and summer various agents complained regarding the quality of eggs coming to their floors from farms in the county of Cumberland. They stated that owing to complaints from customers it became necessary to candle the eggs coming from a number of consignors. This resulted in numerous eggs being rejected for various reasons, such as excessive air cells, albumen too watery, while some were even addled and bad.

In some instances that have been brought under notice investigation has shown the cause of the trouble, which has not been difficult to remedy. But if such eggs are found among those coming from specialised poultry farms, how many more must there be among the consignments from side-line producers, and also from long distance rail and river sources.

Many bad eggs are sold to the public and this undoubtedly results in lessened consumption, as one frequently meets householders, who, having purchased eggs at a high price and found some unsatisfactory, declare that they will buy no more. They are prone to blame the cold store for all the bad eggs, and while no doubt some may come from that source, it is safe to say that the great majority were never in the cool chambers. But wherever the inferior eggs come from the effect is the same, and until better methods are introduced the trouble will exist.

Much could be done in many directions towards the improvement in quality of eggs, and it is only by concentrating upon this objective that the confidence of the public will be gained and the consumption of eggs increased. It is not here proposed to deal with the factors affecting the handling of eggs after they reach the market, but rather with those phases over which the producer has control, and to point out some of the mistakes observed in the handling of eggs before they leave the farm.

Care of Eggs during Summer.

During the cooler months of the year very little trouble is experienced with the eggs then coming into the market, but with the warmer weather ahead the same complaints as previously experienced may be expected unless the causes of inferior eggs are removed. It will be necessary also for greater care to be exercised in the handling of eggs if they are to comply with the conditions governing the quality of eggs as laid down by the Egg Marketing Board, and reprinted below:—

26. There shall be two qualities of eggs of the domesticated fowl, namely:—

"New laid" eggs which shall consist of eggs the air cells of which do not exceed three-sixteenths of an inch in depth and which are not cracked;

"Case" eggs which shall consist of all eggs which do not conform to the quality of new laid eggs and which are not stale or cracked.

27. Each quality of eggs of the domesticated fowl shall be divided into three grades, namely:—

"First grade" shall consist of eggs which shall be not less than 1¾ ounces each in weight with an average weight of not less than 24 ounces to the dozen and which are not dirty, thin or weak shelled;

"Second grade" shall consist of—

(*a*) eggs which are not less than 1½ ounces each in weight and which are not dirty, thin or weak shelled, and

(*b*) eggs which would conform with the standard of first grade except for being dirty, thin or weak shelled;

"Third grade" or "Pullet" shall consist of—

(*a*) eggs which are not more than 1½ ounces nor less than 1¼ ounces each in weight, and

(*b*) eggs which are less than 1¾ ounces, but not less than 1½ ounces each in weight and which are dirty, thin or weak shelled.

28. There shall be one quality of duck eggs, namely:—

"New laid" eggs which shall consist of eggs which are fit for human consumption, and are not cracked.

29. Duck eggs shall be divided into two grades, namely:—

"First grade" which shall consist of eggs which are not less than 2½ ounces in weight, and

"Second grade" which shall consist of eggs which are less than 2½ ounces in weight.

30. No person shall deliver to the Board any eggs in any container which

(*a*) contains both domesticated fowl and duck eggs, or

(*b*) contains domesticated fowl eggs of more than one quality.

31. No producer shall deliver any eggs to the Board in any container unless the container is legibly marked on the end thereof with the following particulars:—

(i) the words "Board eggs only";

(ii) the name and address of the person, firm or corporation by whom or by which the eggs were packed, or the name and address of the producer;

(iii) in the case of domesticated fowl eggs the quality and grade and the number of each grade;

(iv) in the case of duck eggs the words "duck eggs" and the grade and number of each grade.

Causes of Inferior Eggs.

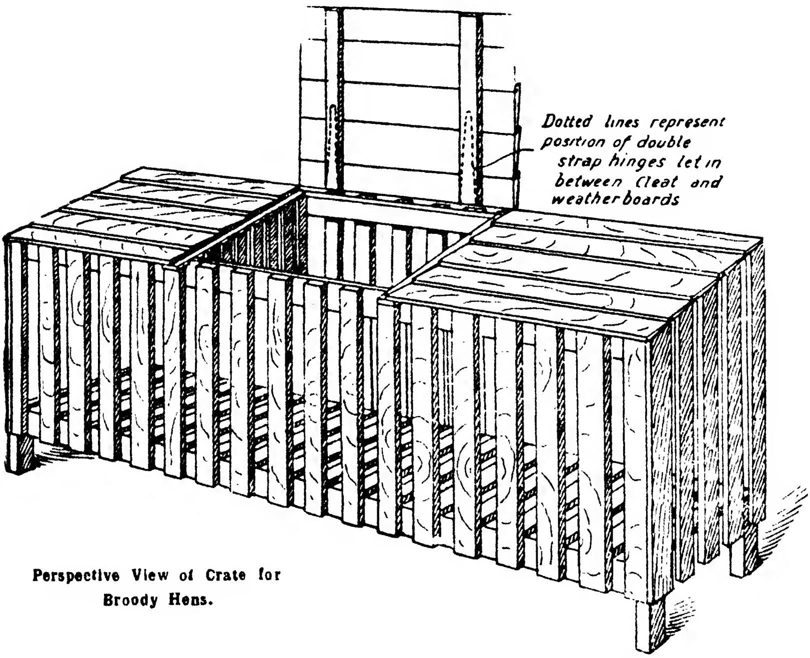
One of the initial factors which has an influence upon the quality of eggs is the feeding of the birds. Any excess of stimulating condiments or forcing foods is likely to result in blood spots or blood streaks in the eggs, which cause them to deteriorate rapidly. On the other hand a ration lacking in the essentials for proper nutrition will not produce good eggs.

Next comes the nesting and housing conditions. If the nests are placed in a position where they are liable to get wet, or if they are allowed to become insanitary, the eggs will be soiled, necessitating washing, which should be avoided if possible. Where the floors of houses are not concreted and they get wet during rainy weather, or where they are not kept reasonably clean, the result is the same.

Care is also necessary when collecting the eggs during wet weather to keep them dry, and this can best be done by having a covering over the collecting tin or basket.

The storage of eggs after collection is an important matter, and it is here that much harm is done to the quality of eggs on many farms. If

they are allowed to stand in the receptacles in which they have been collected, exposed to draughts for a day or so before packing, and, when packed, allowed to remain in a hot room, the air cells will become enlarged, especially in the case of those eggs which are on top. Instances have come under notice where eggs have been placed under a raised building in the summer time with the object of keeping them cool. Under such conditions the outside eggs, being exposed to the drying winds, quickly become enlarged in the air cells and deteriorate in quality. The room in which eggs are kept should be as cool as possible and free from undue draughts, and the eggs should be packed into the cases as soon as practicable.



Perspective View of Crate for Broody Hens.

In the hottest weather it is a good practice to cover the cases with a sheet after packing, and on no account should they be placed out in the sun awaiting the carrier, nor should carelessness on the part of the carrier in neglecting to keep the eggs covered be tolerated.

Washing the Eggs.

The washing of eggs on some farms is not done under the most hygienic conditions, inasmuch as they are sometimes allowed to stand soaking in water and are then washed in the same water, which becomes very dirty, thus allowing any bacteria present to penetrate the thin or porous shells. To minimise the risk of infection by bacteria the eggs to be washed should be placed in a container with a perforated bottom, which can be dipped in a tub or sink full of water to loosen the dirt, and the eggs should then be washed in clean water to which has been added a small quantity of washing soda, the water being replenished when it becomes dirty. As the

eggs are washed they may be placed on a wire-covered tray to drain and afterwards dried off. The eggs should never be allowed to stand in the sun for any length of time.

Broody Hens.

Broody hens sitting on the eggs is a frequent cause of bad eggs, and for this reason it is best to collect the eggs twice daily during the summer time, but at the same time a proper system of handling the broody hens is necessary. A most effective method of coping with the problem is to have a slatted crate with several divisions, as illustrated, so that each night's broodies can be placed in a separate compartment. If a practice is made of catching all the hens as soon as they show signs of broodiness and placing them in the crate, they will be "off the brood" again in three or four days, but when they are allowed to remain on the nests for a couple of days it takes much longer and results in loss of production.

Peanut Meal Feeding Experiment.

An experiment with feeding peanut meal which extended over twelve months has just been concluded at the Government Poultry Farm, Seven Hills. Two pens of ten White Leghorn pullets each were fed a wet mash in the mornings containing 10 per cent. of peanut meal as the only concentrate, and wheat and maize in the evenings, and two check pens each containing the same number of pullets were given the wet mash containing 6 per cent. meat meal, which is usually fed at the farm, with the same evening food as the experiment pens. The results were as follows:—

RESULTS of the Feeding Experiment.

	Peanut Meal Pens.		Check Pens.	
	Eggs Laid.		Eggs Laid.	
	Pen 1.	Pen 2.	Pen 3.	Pen 4.
1928.				
July	102	125	160	127
August	108	155	164	181
September	141	178	201	198
October	168	182	173	203
November	166	194	168	214
December...	138	170	146	184
1929.				
January	128	116	137	158
February	86	73	100	93
March	49	48	28	51
April	16	25	27	10
May	25	23	34	25
June	52	30	45	34
Total	1,179	1,319	1,383	1,478

The birds receiving peanut meal laid 363 eggs less than the check pens, but there was no apparent difference in the condition of the birds. The figures, however, cannot be taken as conclusive, being the result of only one year's trial.

CONTENTS.

Agricultural Gazette of New South Wales.

False Wild Oats.

A. R. CALLAGHAN, D.Phil., B.Sc., B.Sc.Agr., Assistant Plant Breeder.

WILD oats of the species *Avena fatua* have been fallaciously named black oats by farmers in New South Wales, and so unpopular have they become, that to suggest the growing of a true black oat, such as Black Tartarian or Radnorshire Sprig, would at once meet with liberal condemnation. Concerted efforts directed to eradicate the wild oat pest have biassed the minds of our growers against any oat possessing a shade of darkness, and a grower is often blamed unjustly for the dark oats in his sample, which are not true wild oats, but those that come within the scope of this article, and which are commonly called false wild oats. At times, because of these strangers, the farmer's methods of culture are criticised, or the purity of his original seed questioned. That the grower is not always to blame for the occurrence of plants bearing darker coloured grains than those of the variety of his crop of oats may strike a new note, but present-day knowledge submits conclusive evidence that the variety itself, rather than its grower, or the producer of pure seed, is more often to blame.

There is at least one thing quite certain, and it is that the irregular forms which occur in our varieties are not true wild oats. This cannot be too strongly emphasised, for the eradication of wild oats (*A. fatua*) is a problem in no way related to the elimination of the fatuoid or steriloid (false wild oat) nuisance. It is most disconcerting to farmer and pure-seed producer alike that these curious forms should arise, irrespective of the thoroughness of culture or of selection. It is even more distressing when the pure-seed growers are blamed for unavoidable errors, and the cultural methods of farmers, in turn, stigmatised unjustly.

A number of off-types were found in the oat stud rows of the plant breeding plots at both Bathurst and Cowra Experiment Farms last harvest. The varieties concerned were Mulga, Algerian, Guyra, Budgery, and Walla, and the departures from type are later described. In the interim it is well to state that false wild oat grains, resembling in colour the variety of origin, were found in all the abovementioned varieties except Algerian, whilst, with the omission of Guyra and Walla, grey, dark grey, and in some cases black grains, occurred in all cases.

The first reference in New South Wales to the occurrence of strange types was made by Pridham (10, 11) in 1924, when he described irregular forms from Mulga, Sunrise, Lachlan, and Algerian. At the same time it is stated that Sunrise and its derivatives are recognised as the hardest of our varieties to keep pure. Natural crossing is advanced as the possible explanation of their origin. Huskins (4), commenting on the forms described by Pridham (10), states that the types intermediate between *A. fatua* (wild oats) and *A. sativa* (cultivated oats of the English type) were almost

certainly products of natural crossing. Since then, however, a further publication by Huskins ([5]) refers to the discovery of a form differing from the fatuoid false wild oat, and for which the name steriloid is suggested. The majority of the irregular forms found this year in the plant-breeding plots conform to this steriloid type, or at least to its heterozygous counterparts, but those found in the varieties Guyra and Walla are of the fatuoid type.

The method of raising stud seed from single plant selections through to stud rows and stud bulks is a procedure well known to the majority of readers of the *Agricultural Gazette*. That such selection and multiplication rows are thoroughly rogued of all strange types by competent workers is likewise well known, and the chances of a rogue plant of wild oats escaping recognition is extremely unlikely. By recognition of this fact alone, the chances of natural crossing with wild oats are reduced to an absolute minimum. On the other hand, these bizarre strangers, herein described, suddenly appear in the selected stud material, defying all efforts to rogue preceding generations; in other words, they arise without warning in the pure lines of the varieties in question. What then is the cause of their spontaneous appearance?

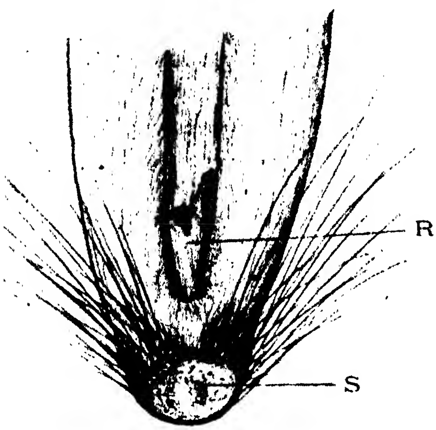


Fig. 1.—The Base of a Primary Grain of an Aberrant form from Mulga.

Note the nature of the basal scar S, the basal hairs, also the rachilla R, which has fractured low down.

Originally it was supposed that the initial cause for the appearance of fatuoids was natural crossing of the variety concerned and the wild oat, *A. fatua*.* Convincing evidence has been brought forward recently by Huskins ([3, 4, 5]) to the effect that these forms do arise spontaneously in a somewhat similar way to "sports," differing in detail in that "sports," or mutants, are due to alterations in a particular locus of the chromosome, hence are gene-mutants, whereas the basic principle of origin of false wild oats is in chromosome aberration. This, to the ordinary reader, amounts to a slight breakdown in the mechanism of reproduction during the initial stages of grain formation. To attempt a clear interpretation here would involve a highly technical discusssion, tending to confuse rather than clarify.

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* The literature on this subject is reviewed by Huskins and Fryer (1925), in an article on "The Origin of False Wild Oats," *Scientific Agriculture* (Ottawa), VI, 303-313, and summarised by Huskins ([4])

A number of arguments have been advanced against the natural crossing hypothesis as an explanation of the origin of false wild oats. The most substantial of all is, of course, the cytological evidence so ably affirmed by Huskins ([3, 4, 5]), to whose works the reader is referred for scientific details. Apart from cytological evidence, the most potent arguments supporting Huskins' theory are, firstly, that false wild oats may differ from the variety in which they occur only in respect of the fatuoid or steriloid complex, involving hairiness of the grain, alteration in spikelet and in grain articulation characters, and development of strong geniculate awns on all grains of the spikelet. That they do differ only in respect of these characters is substantiated in their subsequent breeding, for they segregate only on the basis of a single factor difference, whereas progeny of cross-breds would give detailed segregation of all contrasted characters involved in the cross. Newman ([7]) cites a relative instance, taking difference of panicle as a criterion, and states that false wild oats found in a common oat such as Black Tartarian would, in the second generation, divide into side and open-branching types if they arose as crossings between the above type and the open-branching wild oat type, *A. fatua*. This they do not do. Secondly, Huskins ([5]) reports the origin of a fatuoid as a chimera†, which is perhaps the most conclusive evidence of all in support of his contention.

Description of Abnormal Forms.

Of all varieties grown in New South Wales, Mulga appears to be the most unstable; constant trouble is experienced by both growers and plant breeders in keeping the variety entirely free of strange types.

The off-types most commonly found in this variety resemble Mulga in general hue, the numerous long coarse hairs giving them a somewhat more silvery appearance. These particular forms are almost invariably overlooked by farmers, owing to their unmistakable resemblance to Mulga itself, and it remains to be seen whether these individuals are the progenitors or the progeny of the darker strains also found in Mulga, or whether they merely differ in degree of colouration. Dark grey to almost pure black grains have also been isolated. In every case the grains possessed abundant basal hairs on the primary grain, and to a varying extent on the flowering glume (lemma); and the primary grain was strongly awned, whilst in a few instances plants bearing all grains of their spikelets strongly awned were found. (See Fig. 1.)

It is well to state that the dark-coloured grains differ from the true wild oat in two very essential features. Firstly, the two grains of the spikelet of the aberrant forms are tenaciously attached together, and fracture of the joining rachilla is necessary in separating the grains, whereas in the wild

† A chimera, according to a definition given by Babcock and Clausen ("Genetics in Relation to Agriculture") is a mixture of tissues of different genetic constitution in the same part of a plant. In the case cited, fatuoid grains occurred in the same panicle of oats together with ordinary grains of the variety.

oat the secondary grain articulates with the rachilla of the primary grain, making it difficult to handle the spikelet intact without the two grains falling apart. In the second place, the base of both the primary and secondary grains of wild oats (*A. fatua*) is characterised by a large horse-shoe shaped scar, surrounded by a horny ring of callus, which has earned for the structure the epithet of sucker-mouth. In the aberrant forms of Mulga this basal scar is only a feature of the primary grain, and even then it is far less manifest than in wild oats, being of a somewhat intermediate

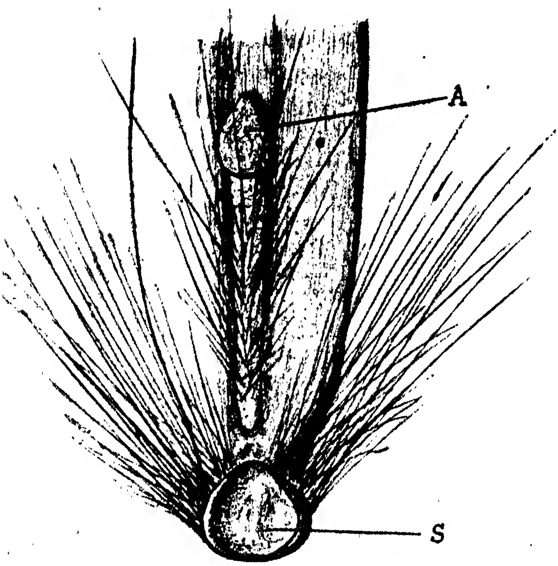

Fig. 2.—The Base of a Primary Grain of an Aberrant form from Guyra, presenting Typical Fatuoid Characters.

The large "sucker-mouth" basal scar S, with its fringe of basal hairs, and the rachilla A with its surface of articulation, should be noted.

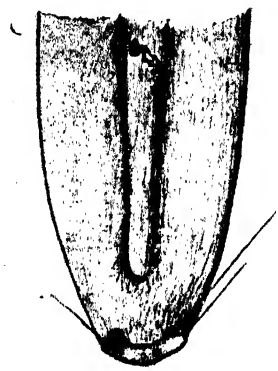

Fig. 3.—The Base of the Primary Grain of a normal Guyra Type.

Note the nature of the basal scar and the rachilla fractured near its summit. The grain is glabrous except for a very insignificant development of basal hairs. These are normally lost in handling.

type and resembling very much the basal scar of Algerian of the species *A. byzantina.* (See Fig. 1.) All forms so far discovered in Mulga conform to the steriloid or heterozygous-steriloid type, but the crucial point in their correct identification can only be attained by subsequent breeding.

Four plants were found in the stud rows of Guyra, uniform in all details, and of true fatuoid appearance. The grains were of a deep brown, resembling closely the colour of the Guyra oat itself. These possessed a definite sucker-mouth and grain articulation similar to the wild oat, together with a strong development of basal hairs, each grain of the spikelet being endowed with strong geniculate awns. In fact the grains resembled the wild oat in every detail other than colour. These are thought to be homozygous (true) fatuoids. (See Fig. 2, and compare with Fig. 3.)

Similar forms to those found in Guyra occurred in a new crossbred variety Walla (Sunrise x Reid*), except, of course, that they resembled, in colour, the variety Walla.

In Algerian, false wild oats, thought to be of steriloid nature, were found. The colour of these forms, however, ranged from grey to black, whilst the grain characters were synonymous with those described as arising from Mulga, except that in this instance both grains of the spikelet invariably possessed strong awns.

Several plants were rogued from Budgery, possessing grain characters similar to the forms described above, spikelets with only the primary grain awned being predominant, a few plants only possessing awns on both grains. One particular plant, however, had brown grains and answered the description of a true fatuoid in that it possessed characters associated with the fatuoid complex. Another plant bore two spikelets portraying a rather peculiar phenomenon. In these cases the primary grains had obviously failed to develop, but instead of the normal double-grain development associated with sterility of the first grain, the flowering glume had split down the back and exposed the secondary grain, as illustrated in Fig. 4. Other spikelets of this plant consisted of grey grains, abundantly haired, the primary grain strongly awned, and, in a few spikelets, the secondary grain likewise awned. This plant is thought to be a heterozygous (unfixed) steriloid.

In all the above instances the growth habit of the plants differed in no way from the variety from which they arose other than in the grain characters, or, in other words, no other morphological character seemed involved other than what the false wild oat complex would determine.

There are a few points worthy of note with regard to growth features of the wild oat, and these may be taken as useful guides in the detection of the true wild oat from false wild forms, especially of the fatuoid type, provided they are accepted with caution.† Firstly, the nodes of the stems in wild oats are fringed with a mass of fine hairs which are not present in fatuoid strangers of glabrous-stemmed varieties. Secondly, the wild variety is almost invariably a taller grower than any cultivated variety it might be associated with. Thirdly, the maturity of the wild oat is *normally* in advance of even our earliest cultivated varieties.

Possible Control of False Wild Oats.

It is obvious that the presence of false wild oats in our varieties of cultivation is a truth of some concern. Some of the strangers, it is granted, may

* Reid is a selection from White Tartarian. They are thought now to be synonymous. Walla is a side-bearing oat.

† It is well established that a great many different strains (varieties) of wild oats exist and it is possible, for instance, to isolate a pure line, the stem nodes of which would be entirely glabrous. However, the most prevalent forms of wild oats in New South Wales do conform to the features cited.

probably be due to natural crossing, but in the majority of cases they would appear to arise quite spontaneously and irrespective of the presence of any wild oat in the vicinity. By way of justifying this statement an experiment has been laid down this year from which it is hoped to ascertain, with certainty, the exact amount of natural crossing, if any, that takes place.

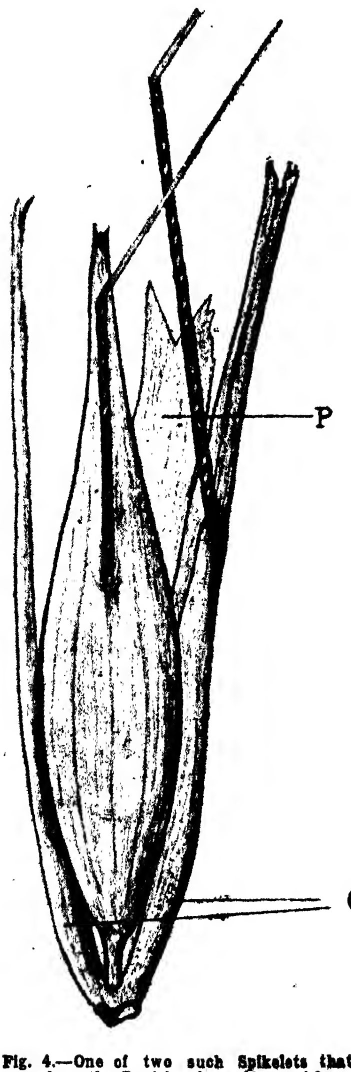

Fig. 4.—One of two such Spikelets that Occurred on the Panicle of an Aberrant form from Budgery.

Note the split flowering glume G, and the palea P. The secondary grain is out of position morphologically with regard to the palea of the primary grain.

Garber and Quisenberry [2] state that false wild oats, unlike the true wild species, have not the same faculty for delayed germination, and that for this reason they are unable to lie dormant in the soil for the same long period as is known to be the case with wild oats, consequently they are less liable to appear as weeds in later crops. Engledow [1] states, however, that this is not universally true of all false wild oats, and that they may increase sufficiently to be injurious is a possibility that must not be ignored.

The most hopeful line of attack has been given by Huskins [6]. This is to the effect that there are possibilities of solving the problem by plant breeding. A few strains of oats have been noted as completely awnless, some of Russian origin, and another strain from Cornell, U.S.A., and it is thought that these types are free of the false wild oat determining factors, that is, that awnlessness in oats is definitely correlated with absence of factors for the fatuoid complex. These awnless types are of very little value agronomically, but Huskins' hypothesis presents hope of elimination of the false wild oat from cultivated varieties by crossing them with the awnless types he describes. With this in mind, the awnless Russian forms have been introduced from Russia by the Plant Breeding Branch, and the writer has also been favoured by seed direct from Dr. Huskins. These strains will be used this season as parents for crossing with varieties like Mulga and Sunrise.

Jones (7), 1927, expressed the opinion that yellow colour in oats possibly inhibited the occurrence of fatuoids in such varieties. This has recently been the subject of much discussion and several cases of yellow fatuoids have since been reported. The most recent report by Stanton and Coffman (12) describes fatuoids from Richland and Iogold, both yellow-grained varieties. Other instances recorded are reviewed by these authors, whilst Love and Craig (8) have since contributed a lucid note of explanation as to how confusion over this point has arisen. From the latter reference (8) it would appear that Jones' (7) original intimation may still be relevant to some extent, for as Love and Craig (8) state: "Certain, but not all, yellows inhibit awns, therefore, one should find yellow fatuoids in some varieties and not in others." This certainly leaves the problem adrift, but at the same time it presents a further possibility, in that any yellow oats which inhibit fatuoid occurrence may prove useful parents. In such a case the yellow oat would bear factors inhibiting awn development.

In conclusion it may be said that, whatever the method of approach, the problem of the elimination of false wild oats is in no way an easy one. It seems to be of paramount importance that greater attention should be paid in future to the details of grain characters in oats.

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Some Observations on Rust Resistance in Wheat.

J. T. PRIDHAM, H.D.A., Plant Breeder.

THE past season at Cowra was the worst for the incidence of stem rust since 1916, and probably no part of the State suffered as badly from this rust as did the Cowra and a few adjoining districts. Although a heavy toll of the wheat yield of the State was taken by stem rust in 1916, the climate of the wheat belt generally is not conducive to much damage from this disease. Warm to hot dry conditions generally prevail during the ripening period when stem rust exerts its greatest effect on the yield. On the north-western slopes, where the late spring and summer rainfall is greater than over the main western wheat belt, the atmosphere is more humid in some seasons at this later stage of growth (as was the case in the Cowra district during the past season), and in such seasons stem rust causes more damage.

The growing of special rust-resistant varieties of wheat is not considered to be of very great significance over the major part of the wheat belt in New South Wales, because of the generally small amount of rust prevalent and of the small depreciation of the yield and quality of the grain in most seasons. Apart from the abnormally wet season of 1916 throughout the greater part of the wheat belt, and some odd seasons in the north-west and the past one in the Cowra district, it is doubtful whether the growing of varieties, such as Federation and Yandilla King, which together occupy a very large area in the State, and which are known to be rather susceptible to rust, has weighed against the farmer, and the Department still highly recommends these varieties as well as others which are by no means rust-resistant. The breeding of wheats resistant to stem rust for the major portion of the wheat belt is therefore not considered to be of vital importance, as it is in other countries such as Canada and the northern part of the United States, where the climatic conditions are very favourable for rust development and where a heavy toll of the crop is taken regularly by this disease.

It is known, however, that some wheats are practically immune or very highly resistant to stem rust, though they are mostly wheats of introduced origin which are not suitable for growing commercially under our conditions. Mr. W. L. Waterhouse, M.C., B.Sc.Agr., of the Faculty of Agriculture, Sydney University, who is investigating the physiologic forms of rust in New South Wales, has so far found several forms to which different varieties have different reactions in the seedling stage, some varieties being resistant to some forms and susceptible to others and *vice versa*. Complete resistance to all local forms is projected by cross-breeding between the varieties indicated by the results of this investigation.

If wheats derived from this crossing yield better than Federation and Yandilla King under western conditions where rust damage is negligible in most seasons, they will replace these varieties there. Even if they yield only as well, they will be more profitable for the odd seasons in which rust damage occurs. It is, however, for the north-west that such wheats will be more useful, because of the comparatively more frequent incidence of the disease in that part of the State. Already there are indications that Federation and the purple straw varieties are not very popular there, on account of their rust susceptibility.

It has been observed for some time that some varieties of wheat which show a moderate amount of rust on the stem give satisfactory yields, or, in other words, that their grain is not materially affected in quality and plumpness. Pinching of the grain with the consequent loss of weight and yield is, of course, the detrimental economic or practical effect of rust infestation. Other varieties, however, are badly affected in yield and quality of grain (*i.e.*, the grain is pinched) with the same moderate amount of rust showing on the stem.

The past season at Cowra has been useful in corroborating data previously obtained and in making further practical observations of value in this respect. It is generally known, of course, that early varieties are said to be more "resistant" than midseason or late varieties. These varieties mainly escape damage because of their quicker maturity, but there is also an inherent practical resistance which differs greatly, even in these early varieties. Clarendon, Florence, Gluyas Early, and Thew are reckoned to be more resistant to rust than many other early varieties, and Waratah and Binya, though both rusted at Cowra last year, gave better grain and higher yields than their "rustiness" would lead one to expect. Early varieties which were badly affected in the grain by the rust on the plants were Bald Early, Garra, Bobin, Improved Steinwedel, and Ranee.

Midseason to late varieties which, though rusted, had satisfactory grain, and the yield of which was not markedly affected, were Dundee, Nabawa, Warren, Burrill, and Barwang. Union, Penny, Federation, Bena, Exquisite, and Yandilla King were badly attacked: the grain was much shrivelled and pinched and the yield was markedly depreciated.

Mr. L. H. Newman, Dominion Cerealist, Department of Agriculture, Canada, has observed a similar condition in that country. Writing of a recently evolved wheat, Reward, he says: "Though not classed as resistant, it came through the rusty seasons of 1923, 1925, and 1927 remarkably well."

Moreover, it is now found that many varieties of wheat give different rust reactions at a later stage of growth to those which they give in the seedling stage. Field observations on varieties such as those described above are therefore of the greatest value, not only in determining the most resistant varieties from a practical or economic standpoint, but also in indicating the best varieties for use as parents in crossing to breed for greater practical resistance to rust in those parts of the State where improvement is desirable in this respect.

Potato Trials on the Upper North Coast, 1928-29.

M. J. E. SQUIRE, H.D.A., Agricultural Instructor.

In co-operation with Messrs. J. J. Gray, Palmer's Channel, Clarence River; M. D. O'Connell, Riverbyn, Coramba; and R. Grace, North Dorrigo, the Department carried out potato variety and manurial trials last season. The season was not favourable, the spring being very dry, while, in the case of Dorrigo, too much rain fell during late summer. The trials at Coramba were spoiled by the dry conditions.

Factor again showed up best in the variety trial and is becoming very popular among growers on the Upper North Coast The yields in the variety trial were as follows:—

Variety.	Palmer's Channel.			North Dorrigo.		
	tons.	cwt.	qrs.	tons.	cwt.	qrs.
Factor	4	15	2	10	7	1
Satisfaction	4	13	1	9	12	2
Up-to-date	4	10	0	Poor stand—no weights taken.		

From the results of the manurial trial given below, it will be seen that cow manure combined with superphosphate gave the best results, although, at Dorrigo, superphosphate alone (2½ cwt. per acre) was not very far behind. The top-growth of the plots manured with cow manure and superphosphate was more vigorous and healthy in appearance than any of the other plots, and this appearance was maintained throughout the growing period, while the change from dry to wet conditions did not force the growth to any extent. The tubers of these plots were well grown, even in size, and there was very little second growth.

The superphosphate-treated plots made good growth, but the tubers harvested were very uneven in size and shape and had made a considerable amount of second growth.

The unmanured plots made only fair growth and ripened prematurely during the dry weather. However, a small amount of second growth was made.

Fertiliser per acre.	Palmer's Channel.			North Dorrigo.		
	tons.	cwt.	qrs.	tons.	cwt.	qrs.
Cow Manure (3 tons) and Superphosphate (2½ cwt.)	5	15	1	10	14	0
Superphosphate (2½ cwt.) ...	4	15	2	10	7	1
No Manure	3	16	3	7	11	1

The Importance of Pasture Improvement to Fat Lamb Production.

J. N. WHITTET, H.D.A., Agrostologist.

In Australia the improvement of pastures will assuredly play a big part, not only in increasing the number of lambs raised, but also in producing better quality sheep—incidentally increasing the return from wool, since the animals will be grazing on more nutritious and better-quality food.

New South Wales graziers with holdings on the Central and Southern Tablelands, Central-western and South-western Slopes, and Eastern Riverina can improve their country by the use of introduced grasses and

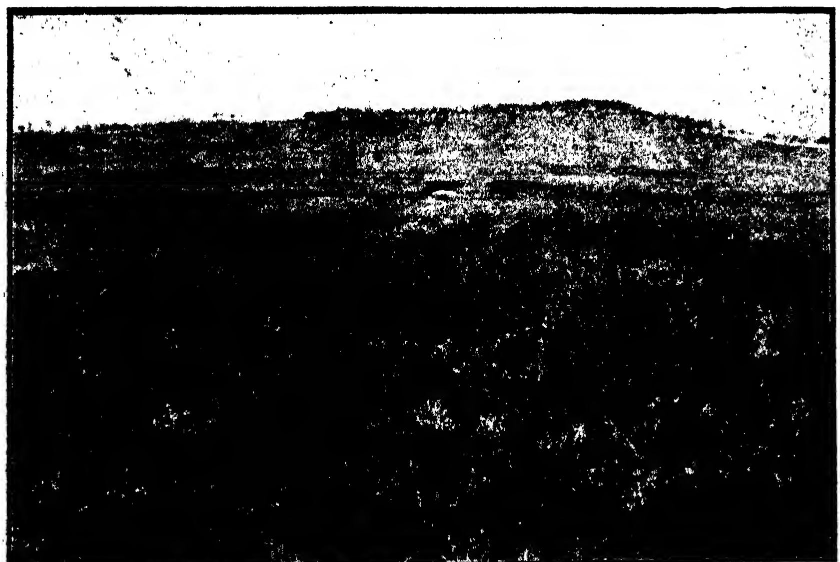


Fig. 1.—An Excellent Pasture at Nimmitabel, Southern Tableland. It consists of Perennial Rye grass, lucerne, and clovers.

clovers, by top-dressing with superphosphate, and by establishing large areas of grazing lucerne. Fat-lamb raisers with large holdings can adopt similar methods. The mixed farmer has the necessary plant available, and consequently is in an excellent position to grow large areas of fodder crops, such as oats, rape, &c., for grazing purposes, and also to plant lucerne.

The Northern and Southern Tabeland country is well suited to the production of winter grasses and clovers, and, as these plants produce their best growth during the period of the year when succulent green feed on the natural pastures is generally lacking, their value is beyond all question. In these two localities the rainfall is generally good, and other climatic

conditions are ideal for these cold climate plants. Lucerne is also being largely planted for grazing purposes on the freer working types of soils of districts such as Cooma and Glen Innes, and with proper attention will give satisfactory results for eight or ten years before it commences to thin

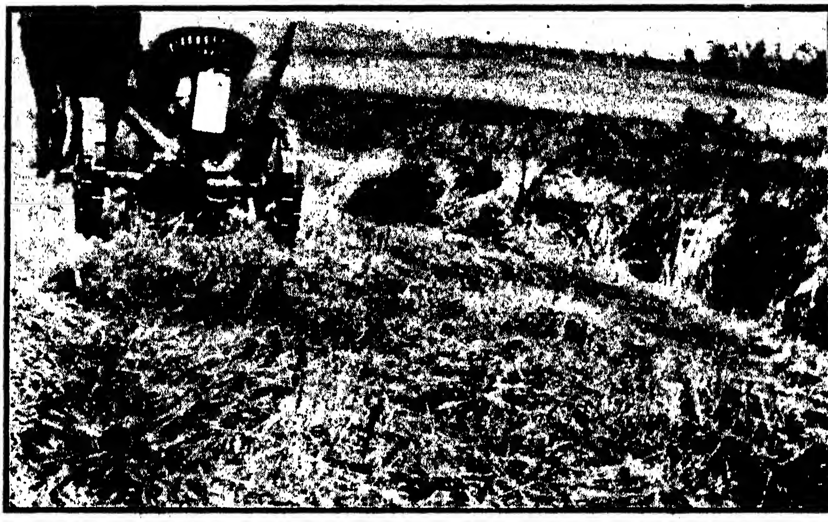


Fig. 2.—Cutting Surplus Growth of Perennial Rye Grass and Clovers for Meadow Hay at Nimmitabel.

Fig. 3.—Toowoomba Canary Grass (*Phalaris bulbosa*) at Ben Lomond.

This grass provides succulent feed during the winter months especially in the colder parts of the Northern Tablelands.

out extensively, and even after this period the carrying capacity of paddocks fifteen years old is often greater than that of natural pastures.

The total number of sheep in New South Wales for the year ended 30th June, 1928, was 50,510,000. At the end of June, 1927, the total was 55,930,000, or 5,800,000 more than the rest of Australia put together. In

1891 the numbers reached 61,831,416, this being the highest figure ever recorded for the State.

The fact that wool has been decreasing in price of recent years is turning the attention of pastoralists located in the more favoured districts of the State to fat-lamb production. The consumers of meat, whether they be overseas or local, are incessant in their demand for small joints, and the choice cuts of beef or mutton, and, therefore, good quality lamb always finds an ample market.

Fig. 4.—"Topping-off" Lambs for Market on Lucerne in the Eastern Riverina Division.

The following average values of sheep at Flemington sale yard indicate that the production of lambs is an extremely valuable and payable proposition when compared with the raising of adult sheep:—

COMPARATIVE Prices of Wethers and Lambs at Flemington.

	1923.	1924.	1925.	1926.	1927.
Crossbred wethers (prime and good) ...	28/9	37/-	34/-	24/9	22/9
Merino wethers (prime and good) ...	33/3	36/-	35/3	24/-	22/6
Lambs and woolly suckers (prime and good).	24/-	29/-	28/3	21/-	20/-

Prime suckers often bring as much at Flemington as wethers, and the supplier not only receives his money quicker, but also has the opportunity of allowing a greater area of his country to recuperate than would be the case if he were fattening adult sheep.

The Export Trade.

During 1928, the number of carcases of lambs shipped from Australia to the British Isles totalled 1,250,000, for which exporters were able to pay 5½d. to 6½d. per lb. This supply is altogether too small to keep Australia

on the English market for more than a few months of the year, whereas Argentine and New Zealand are able to retain a continuity of supply right throughout the year. During 1927, the supplies of Australian lambs to the English market were recorded from 1st January to 10th June, and 18th November to 31st December, only. The Chairman of the Metropolitan Meat Industry Board considers that an increased spring lambing in cold districts would considerably assist in keeping up the continuity of supply.

The 22,000,000 acres of lucerne in the Argentine, on which huge numbers of stock are grazed annually, and New Zealand's excellent pastures of succulent grasses and clovers, are the main factors in enabling these countries to retain their continuity of supply of baby beef and lamb on the English market.

Fig. 5.—A Paddock in the Young District, Top-dressed Eight Months Previously with 1 cwt. Superphosphate per acre.

A profuse growth of clover and grasses has crowded out weeds.

Fig. 6.—An Adjoining Paddock not Top-dressed.

Note the prevalence of saffrom thistles and the thinness of the feed.

The New South Wales export of lamb during the past three years was: 1925-26, 418,568 carcases; 1926-27, 603,822 carcases; 1927-28, 352,745 carcases. According to the report of the Metropolitan Meat Industry Board the drop in the number of carcases of lambs exported during the year ended 30th June, 1928, was largely due (1) to the dry season, (2) to the demands of the increasing number of city and suburban dwellers for lamb, (3) to the satisfactory price obtained for wool during that period.

The Present Supply of Lambs.

There are two essentials to the raising of good quality lamb, viz.: (1) The breeding of the right class of lamb; (2) the provision of an ample supply of succulent feed which will prevent ewe and lamb from receiving any check during the critical period of the lamb's development. In normal

years lambs reared on natural pasturage are marketed during spring or early summer months. The majority of these lambs are raised on areas which are generally spoken of as "herbage" country, the principal succulent plants of such pasturage being Burr clover or trefoil, and Ball clover. These lambs come from the warmer districts of the State, and any carcases not required for local consumption are cold stored for export.

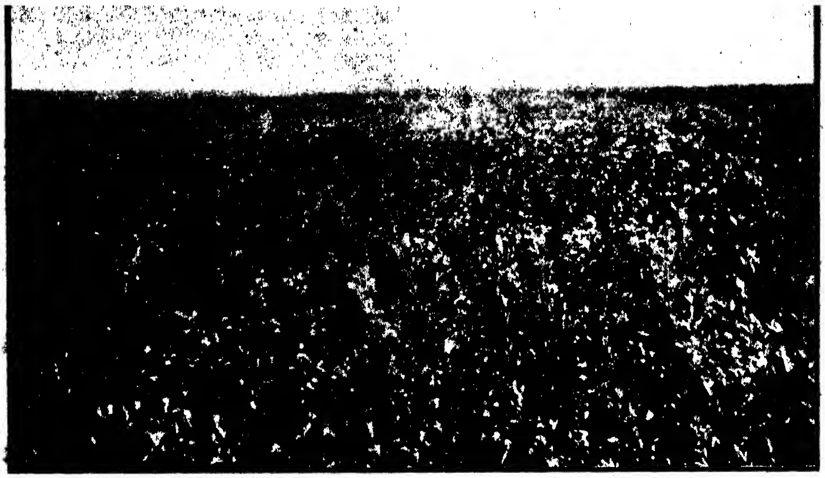


Fig. 7.—Lucerne for Grazing Purposes on Hill Country at Cooma, Southern Tableland.

The following table, giving the number of sheep in the divisions of the State for the year ended 30th June, 1928, shows that the Northern and Southern Tableland areas produce comparatively few lambs compared with other localities.

SHEEP in Divisions of the State, 30th June, 1928.

Division.	Total Area in Acres.	Sheep 1 year old and Upwards.	Lambs—Under 1 year.
Northern Tablelands	8,119,120	2,700,801	271,817
Southern Tablelands	7,644,589	2,611,585	589,176
Central Tablelands	10,716,534	3,859,185	883,556
North-western Slopes	9,219,049	4,554,680	895,850
Central-western Slopes	7,723,105	3,565,037	927,305
South-western Slopes	11,221,717	5,101,303	1,227,731
Riverina	17,027,933	5,186,291	1,341,240
North Central Plain	9,579,406	3,672,795	734,112
Central Plain	14,811,297	4,433,643	802,115

As already pointed out, the majority of lambs marketed at Homebush are received during the period August-December, and constitute the drop from the warmer districts of the State—where lambing is in progress during autumn and early winter months. Lambs from these warmer districts must

be marketed before grass seed becomes plentiful, owing to the fact that carcases for the export trade must be free of this deleterious grass seed infestation.

Districts such as New England and the Southern Tableland are producing large quantities of fine wool, and it is not advocated that fat-lamb raising should supplant this work; the large holdings can still carry on with the production of fine wool, and the mixed farmer and small grazier could pay attention to fat-lamb production.

The supply period of lambs to Flemington is exemplified in the following figures, which record the sales made by one of the main lamb-selling agents operating there:—

1928.		1928.	
January	2,516	July	501
February	2,091	August	2,146
March	1,810	September	3,158
April	764	October	6,049
May	1,172	November	7,578
June	424	December	11,067
		Total	39,276

These figures only deal with suckers, and do not include lambs older than five months.

More Extensive Top-dressing of Pasture would Increase Lamb Production.

In the early part of 1926 the Government Statistician, at the Department's request, included a section for top-dressed pasture in his returns, and his reports showed that, for the period 1926-27, 19,314 acres were top-dressed with superphosphate, 16,975 cwt. of this fertiliser being used. The figures for 1927-28 are now to hand and show a considerable increase—40,296 acres being top-dressed with 34,966 cwt. of superphosphate. In considering these figures it must be remembered that the general recommendation for Tablelands, Slopes, and Eastern Riverina is 1 cwt. of superphosphate every second year, it having been demonstrated that such an application will increase the carrying capacity by from 50 to 130 per cent. at the low cost of 3s. 6d. to 4s. per acre per annum. As the majority of graziers are adopting the Department's suggestions, the area of top-dressed country on which sheep were grazing in 1927-28 would be approximately 50,000 acres.

Of the 40,296 acres top-dressed in New South Wales during 1927-28, the main areas treated in sheep districts were: South-western slopes, 18,865 acres; Central Tableland, 8,681 acres; Eastern Riverina, 2,360 acres; Southern Tableland, 2,521 acres; Central-western Slopes, 1,232 acres. When the area of land in these divisions that would readily respond to fertiliser is realised, the areas treated are exceedingly small. In these five divisions, the incidence of the rainfall and the pasturage present are ideal for producing an increase in carrying capacity by the application of fertiliser.

The following table shows the total areas of these divisions, the areas cultivated, the areas of pasture and bushland, and the number of sheep carried for the year 1927-28:—

Division.	Total Area.	Alienated Land Suitable for Cultivation, 1927–28.	Balance, Pasture and Bushland, 1927–28.	Number of Sheep carried, 1927–28.
	acres.	acres.	acres.	
South-western Slopes	11,221,717	4,560,127	6,867,062	6,329,034
Central-western Slopes	7,723,105	3,708,759	4,034,101	4,492,342
Central Tablelands	10,716,534	1,517,585	9,222,685	4,742,741
Eastern Riverina	5,498,286	3,335,000	2,055,034	2,920,896
Southern Tablelands	7,644,589	327,051	7,356,873	3,200,761

If only 25 per cent. of the area shown under pasture and bushland in these five divisions was top-dressed with 1 cwt. of superphosphate per acre every second or third year, it is safe to assume that an additional 3,500,000 lambing ewes could be carried, basing the assumption on the very conservative estimate of the improvement effected being only at the rate of a sheep to every 2 acres.

Grasses, Clovers, and Lucerne Increase the Carrying Capacity.

In these divisions during 1927-28 only 3,486,471 of the 13,448,522 acres of land suitable for cultivation on alienated holdings were under crop, and as these "unused" areas comprise the best class of pasture country, which readily responds to superphosphate, the carrying capacity of these divisions can be considerably increased at a very low cost by top-dressing.

When we turn to the establishment of introduced grasses, clovers and lucerne, the Statistician's figures, given in the following table again supply interesting data, and indicate that there are large areas of land available which are suitable for cultivation, but which are not used for that purpose. Portions of such areas, where the soil is friable and deep, could undoubtedly be utilised for the production of grazing lucerne, and, on soils unsuitable for lucerne, shallower-rooted pasture plants, such as grasses and clovers, could be established.

AREAS Suitable for Cultivation in Divisions.

Division.	Total Area of Division.	Alienated Land suitable for Cultivation. 1927–28.	*Area under Crop. 1927–28.	*Area under Lucerne. 1927–28.	*Area of sown Grasses. 1927–28.	*No. of Sheep carried. 1927–28.
	acres.	acres.	acres.	acres.	acres.	
Northern Tableland...	**8,119,120**	**365,936**	**77,609**	**3,550**	12,011	**2,972,618**
Central Tableland ...	**10,716,534**	**1,517,585**	**361,353**	**53,642**	13,524	**4,742,741**
Southern Tableland...	**7,644,589**	**327,051**	**42,285**	**20,369**	4,141	**3,200,761**
North-western Slopes	**9,219,049**	**1,495,927**	**434,306**	**20,469**	3,915	**5,450,530**
Central-western Slopes	**7,723,105**	**3,708,759**	**931,109**	**21,464**	28,101	**4,492,342**
South-western Slopes	**11,221,717**	**4,560,127**	**1,228,684**	**50,812**	20,450	**6,329,034**
Eastern Riverina ...	**5,498,286**	**3,335,000**	**972,004**	**2,325**	5,081	**2,920,896**
Western Riverina ...	**11,529,647**	**2,660,182**	**342,821**	**7,061**	12,033	**3,606,635**

* Total on alienated and Crown lands.

The total area cropped each year in New South Wales during the period 1922-28 has been less than 5,000,000 acres, and it appears that at least 6,000,000 acres of the area considered to be suitable for cultivation in these eight divisions could with advantage be used for the production of improved pastures.

The areas under lucerne could be considerably increased in all the divisions mentioned. In 1927-28 the South-western Slopes and Central Tableland, with a total of 104,454 acres of lucerne, provided more than half of the total acreage of lucerne grown in the eight divisions under review. The "safe" districts—where plenty of land is available for the production of grazing lucerne—are the Central-western Slopes, South-western Slopes, Eastern Riverina, and the Central Tableland. With the

Fig. 8.—An 8-year-old Stand of Lucerne at Temora Experiment Farm.
It still provides a large bulk of feed.

large tracts of country suitable for cultivation, but not utilised for that purpose, it is safe to assume that 2,000,000 to 3,000,000 acres of lucerne could be established for grazing purposes. Such an area would be of inestimable value in the production of fat lambs for export and local consumption, as it would carry 5,000,000 to 8,000,000 ewes with sucker lambs. The areas in the warmer districts would increase the present supply of spring and early summer marketed lambs, and these could be cold stored until required for export.

In the drier parts of the State 2 lb. of good quality lucerne seed per acre is sufficient to sow for grazing purposes. The cost of establishing lucerne largely depends on the amount of soil preparation required. On self-mulching soil, where no working is needed, seed can be distributed per medium of pasture top-dressing machines, or old wheat broadcasters, at an acre cost of 3s. 6d. for seed (2 lb. at 1s. 9d.) and 1s. 6d. for distribution;

the seed can be worked into the soil when it is dry by driving a mob of sheep over the area. On friable soil, where weeds are not plentiful, lucerne can be established by simply working the seed in with the combine, at a total cost for seed and distribution of 6s. 6d. per acre. On country that has to be worked twice with a heavy disc cultivator and the seed drilled in, the cost of establishment will be approximately 11s. per acre. These costs are based on wages at 14s. 2d. per day, and include depreciation on machinery, horses, &c. If ½ cwt. of superphosphate per acre is used when planting the seed, add 3s. to the figures already given.

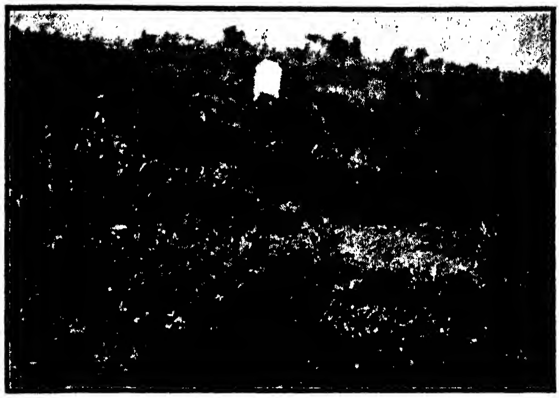


Fig. 9.—A Good Stand of Grazing Lucerne at Trangie Experiment Farm. Trangie is situated on the boundary of the Central-Western Slopes and Central-Western Plains Divisions.

Statistics for the period 1926-27 show that in New South Wales there were 185,881 acres of lucerne—95,103 acres being cut for hay and 90,678 utilised as green feed. An increase in area was reported during 1927-28 as the figure of 213,285 acres was returned—109,194 acres for hay and 104,091 green feed.

The Periods of Lambing and the Feed Supply.

In very cold districts, such as the Northern and Southern Tablelands, a spring lambing is carried out owing to lack of succulent feed during winter months, and the fact that lambs would die if dropped during the cold weather. Winter grasses and clovers will thrive in these localities, even during the coldest period of the year, and if landholders would devote more attention to the establishment of improved pastures, plenty of succulent feed would be available during spring and early summer months.

Fig. 10.—A Heavy Tripod and Chain Grass Harrow. It is being used to work in grass and clover seed on an established pasture.

During 1927–28 the areas of sown grasses on the Northern and Southern Tablelands were 12,001 acres and 4,141 acres, respectively, whereas the areas suitable for cultivation on alienated holdings, but not utilised for that purpose, were 288,826 acres and 284,985 acres, respectively. Portions of

these cultivation areas could be put to a more useful purpose by planting them with a winter grass pasture mixture than allowing the land to lie idle from cultivation. Good grazing lucerne can be produced on much of the country that is suitable for cultivation, but the total area of this crop in the two divisions mentioned is only 23,919 acres.

On the Southern Tableland Subterranean clover can be readily established among the native grasses, and the carrying capacity of the area is often more than doubled as a result of such improvement work—the cost of 1 to 2 lb. of seed per acre amounts to only a few shillings. This clover would provide succulent pasturage during spring and early summer months, and so fit in with the lambing period for the district. Similar work could be undertaken on the Northern Tablelands, substituting Black Medic (*Medicago lupulina*) where Subterranean clover does not thrive. In Tableland districts Perennial Rye grass and White clover give excellent results in low-lying land that is at all damp. A seed mixture of 3 lb. of rye and 1 lb. of White clover distributed on this class of country among the native grasses would cost less than 3s. per acre for seed. Wherever possible, grass harrows of the tripod and chain type should be used to stir the surface soil and work in a few pounds of seed of grasses such as Perennial Rye and Cocksfoot on the area. Seed of these grasses is very cheap, and plants of this nature provide green feed when the summer native grasses are dry and unpalatable.

Detailed recommendations for pasture improvement work in the various districts of the State have already been published in pamphlet form and can be obtained free of charge on application to the Under-Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney.

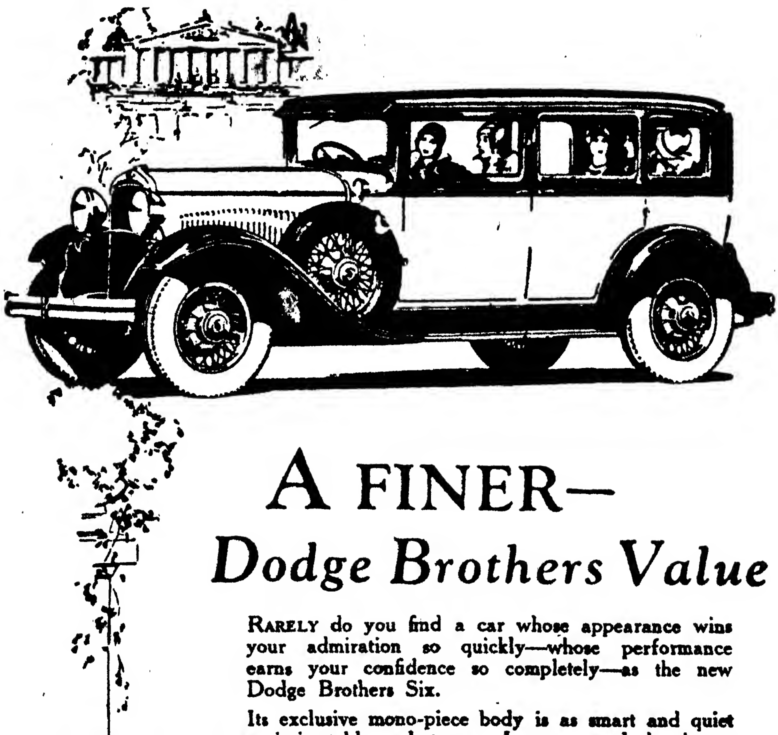
Fitzroy Seed Maize Contest at Grafton Experiment Farm.

Seed maize contests, having as their aim the encouraging of the growing of one of the most popular coastal varieties, Fitzroy, will again be conducted by the Department of Agriculture at Grafton Experiment Farm. These tests will take the form of yield tests, and growers are invited to submit 5 lb. samples of seed, which will be grown under uniform conditions, and a certificate of merit will be awarded the owner of the highest-yielding sample.

It will be necessary to limit the number of competitors to about twenty-five, and the Department also reserves the right of refusing any sample not sufficiently pure or true to type, which precaution is necessary in order to safeguard the purity of the seed at the farm.

These tests have proved of considerable value in improving the yielding qualities of maize, as well as creating a demand for seed, particularly from those farmers who are successful in these contests

Samples of seed should be addressed to the Manager, Experiment Farm, Grafton, while further information concerning the contest can be had from the Under Secretary, Department of Agriculture, Box 36A G.P.O., Sydney, or from the Farm Manager.



Field Maize Competitions.

Royal Agricultural Society's Championships, 1928–29.

L. S. HARRISON, Special Agricultural Instructor.*

FIELD Maize Championships under the auspices of the Royal Agricultural Society are now conducted throughout the maize-growing centres of the State. The fact that they have been so widely accepted is in itself an indication of the value that growers place on them; the educational value is such that it cannot be ignored by men who are progressing in the industry and can see the necessity for further progress.

In some districts decided improvements were noticed this season—in certain aspects of disease control, and particularly in regard to the use of suitable varieties, in the matter of seed selection and in consideration of type.

It is undoubted, however, that more societies could enter these competitions and improve the local outlook for the maize grower. Although five districts competed this year in the championships, it could not be said that every local society within those districts was represented. However, the extremely unfortunate season for summer-growing crops was much to blame. On the coast an unusually dry spring occurred, which in February was followed by floods of excessive severity. Whilst early conditions inland were reasonably satisfactory in some parts, too much rain fell at a later stage, considerably damaging the crops; other parts of the inland areas suffered so much from drought the previous winter that satisfactory maize-growing under such conditions was an impossibility. It is confidently anticipated, however, that the forthcoming season will show a decided improvement in point of numbers. Many societies which intended to compete in this competition, and actually took the necessary steps in their schedules, were prevented through the exigencies of the weather.

The North Coast this year was actually represented by the Kyogle, Dorrigo, and Bellingen societies; the Central Coast by the Macleay, the Manning, and Hawkesbury societies; the South Coast by Kiah (Eden), Pambula, Bega, Moruya, Nowra, Kangaroo Valley, and Albion Park societies; the New England and Inverell districts by Tenterfield, Glen Innes, and Armidale societies; and Tumut and Gundagai districts by those two societies.

The crops were judged on the basis found satisfactory the previous year. Accordingly the following points were allotted at about the tasselling stage:—(1) Cleanliness and cultivation (maximum 25 points); (2) germination and stand (maximum 10 points); (3) general appearance and condition, evenness, &c. (maximum 10 points); and additional points were allotted when the crop was mature as follows:—(4) Freedom from insect

* Mr. Harrison judged the five district championship competitions.

pest and disease (maximum 10 points); (5) purity and trueness to type (maximum 15 points); (6) estimated yield (on the coast 3 points for every 10 bushels, and inland 3 points for every 5 bushels).

The area on the coast is 2 acres, whilst in New England and Inverell it is 5 acres, and in the Tumut and Gundagai districts it is 3 acres.

Tumut and Gundagai District.

Weather conditions in the Tumut district were not altogether ideal, but showers at suitable times saved some of the crops from what would otherwise have been mediocrity.

With the almost entire absence of winter rains on the Murrumbidgee section of the Gundagai district, as was the case last year, it was practically impossible to grow even reasonably good maize crops, because of the necessity of conserving winter rainfall for the following crop. Early ploughing for the purpose of conserving this rain is recognised locally as of the greatest importance, and when winter rain does not fall in good quantities the chances of good crops the following summer are very slight.

Messrs. Brown and Davis's Crop at Tumut.

The Tumut and Gundagai district competition was won by Messrs. Brown and Davis, of Tumut Plains, Tumut, who competed in this section against Mr. P. Walsh, of Gundagai.

The winning entry was of the Murrumbidgee White variety, and lost a few points under the heading of "Type and Purity"; it was showing evidences of interpollination. The crop was situated on the alluvial banks of the Tumut River at Tumut Plains, was on land that had been under cultivation for some considerable time, and followed a previous crop of maize. Ploughing for this crop did not take place until November, which was closely followed on the 21st of the same month by planting. A double dropper was used, with rows 3 feet 9 inches apart, and with three or four

grains dropped about every 3 feet in the rows. The crop was scarified once. The area on which this crop was grown was a particularly suitable one for the production of excellent maize crops, although the land is subject to what are known as "sandy patches." There was in this crop a trace of maize smut—a trouble not very frequently seen in recent years. If the smut assumes dangerous proportions it will be necessary to give that particular piece of land a spell, and care must be taken to see that no smut finds its way on to the clean ground. A little root and cob rot was noticeable through the crop as well.

Mr. P. Walsh, of Gundagai, whose entry was situated on the Tumut end of the Gundagai district, gained second place. It was on alluvial soil on the Tumut River, and subject at times to flood damage. The land had been under cultivation for eighteen years, and was planted to maize last year. Ploughing took place in September, and the land was cultivated, harrowed, and rolled. Planting took place in the middle of October with a double-row dropper, 3 feet 9 inches between rows, with two or three grains every 3 feet. The variety was a Silvermine type, and showed some interpollination, and considerable variation from the fixed type. This crop was very much affected by the severe dry conditions, but in its early stages it gave promise of a reasonable return.

The awards in this district were as follows:—

TUMUT and Gundagai Maize Championship.

Competitor.	Points awarded.						
	Cleanness of cultivation. (Max. 25 points.)	Germination or stand. (Max. 10 points.)	General appearance and condition, evenness, &c. (Max. 10 points.)	Freedom from insect pests and diseases. (Max. 10 points.)	Purity and trueness to type. (Max. 15 points.)	Estimated yield.*	Total.
Messrs. Brown and Davis, Tumut Plains	22½	8	7½	7	10½	39	94½
Mr. P. Walsh, Tarrabandra, Gundagai	24	8½	7½	8½	10	21	79½

* Three points for every 5 bushels.

The varieties most suitable for the Tumut district are Early Clarence and Murrumbidgee White, with Funk's Yellow Dent and Iowa Silvermine for the second-class alluvials.

The Gundagai district is best served by Funk's Yellow Dent and Iowa Silvermine.

New England and Inverell District.

Maize-growing in New England is recognised as of great importance in the scheme of mixed farming operations. It is a crop that may be grown successfully almost every year, weather and soil conditions being suitable to its production. The type of grain produced is particularly suitable for

storage, a feature that is of considerable economic importance, as the future of the maize industry depends on some system of efficient storage being devised to enable the maize to be marketed at desirable periods to avoid the unfortunately low prices brought about by glut supplies. As maize is regarded as such a particularly good emergency fodder for sheep feeding, it is obvious that stocks must be retained to be available when most urgently required, and New England maize in particular is eminently suitable for such storage.

Mr. G. B. Koch's Winning Crop at Tenterfield.

The New England championship was won by Mr. W. T. Holloway, Kelly's Plains, Armidale. The winning crop was grown on land that had been under cultivation for fifteen years, and followed a crop of oats. Ploughing took place early in September, after which the land was cultivated and harrowed. A crop of maize was planted on 1st October with a double dropper and then harrowed. Sheep were turned in, in the middle of November. It was cultivated again and replanted on 21st November with a double dropper in rows 3 feet 8 inches apart, and three grains every 2½ feet. After the crop was up it was harrowed and scarified four times. The variety used was based on a foundation of Wellingrove, but showed an excessive number of varietal mixtures, the plants being of varying maturity and faulty in type. The crop, however, was one of outstanding merit, and reflected considerable credit on Mr. Holloway for having brought his land into such a satisfactory condition. The estimated yield of 65 bushels was particularly good for this district.

Mr. G. B. Koch, of Tenterfield, came second with an entry of Hickory King. This was also a particularly good crop, and was grown on a fertile creek flat. The land was four years under cultivation, and the previous

crop was maize. Ploughing took place in September, after which the land received two harrowings. It was planted in the middle of October with a double dropper, the rows being 4 feet apart, with one grain dropped every 15 inches. After the crop was up it was harrowed and cultivated three times and hoed. This was an even crop, and the estimated yield of 60 bushels must be considered as quite satisfactory for the Tenterfield district.

The third place in the New England championship was given to Mr. W. H. Wilson, Glen Innes. The crop was grown on black soil following a crop of oats. Ploughing was done on 5th August, and the land was cultivated, harrowed, and rolled. Planting took place towards the end of October with a double dropper, 3 feet 8 inches between the rows, and the same distance between the drop of three in the row. The variety was Wellingrove, and there was a trace of root and cob rot.

The following table gives the points awarded in the New England championship:—

NEW ENGLAND Field Maize Championship.

Competitor.	Points awarded.						
	Cleanness of cultivation. (Max. 25 points.)	Germination or stand. (Max. 10 points.)	General appearance and condition, evenness, &c. (Max. 10 points.)	Freedom from insect pests and diseases. (Max. 10 points.)	Purity and trueness to type. (Max. 15 points.)	Estimated yield.*	Total.
W. T. Holloway, Armidale ...	23½	8	9	8	8	39	95½
G. B. Koch, Tenterfield ...	24	7½	9	8	10½	36	95
W. H. Wilson, Glen Innes ...	23½	7½	8½	7½	10½	33	90½

* Three points for every 5 bushels.

Varieties that are considered desirable for New England are:—(*a*) For the Tenterfield district—Wellingrove, Funk's Yellow Dent, Golden Glow, and Iowa Silvermine; (*b*) for the Glen Innes district—Wellingrove (particularly suitable), Large Goldmine, and Goldmine Crossbred (fairly successful); (*c*) for the Armidale district—Wellingrove and Large Goldmine.

The North Coast Championship.

Earlier in the year, before the exceptionally dry spring was experienced, this competition had aroused considerable interest on the Upper North Coast, and whereas last year Bellingen was the only entrant, six societies, viz., Kyogle, Casino, Bonalbo, Grafton, Bellingen, and Dorrigo entered this year. However, because of the severity of the early conditions, only three societies actually competed, these being Kyogle, Bellingen, and Dorrigo.

Maize-growing on the North Coast is recognised as of great importance, and the high value of the grain as a stock food is being recognised.

Many farmers already have for some time appreciated its value when fed to pigs or to dairy stock, both as grain and as green feed, either fed direct or as silage. By far the greatest contribution to the State's production of maize is grown on the North Coast, and the support of the championships would thus be expected in such a district.

The Kyogle entry was a particularly good one. It was situated on Lynch's Creek about 14 miles from Kyogle on excellent maize-growing flats. The owner (Mr. J. Campbell) makes a practice of rotating his maize-growing with oats or grazing lucerne for two or three years and then sowing maize again. The previous crop was oats, and the paddock was twice ploughed before planting took place in the middle of December. The

Another of the Competition Crops in the New England District.

paddock had been under cultivation for eighteen years, and after the crop was up it was scuffled four times. Fitzroy was planted with 4½ feet between rows, and two or three grains were dropped every 3 feet. The type of Fitzroy used by Mr. Campbell was particularly free from disease and had been carefully selected to a definite type, but it showed variation from the true Fitzroy.

Mr. M. McBaron, Raleigh, came second, also with a crop of Fitzroy. His paddock had been under cultivation about two years, and the crop followed a crop of winter cereal for green feed. The paddock was ploughed in December and planting took place towards the end of that month. Superphosphate was used at 1½ cwt. per acre. The maize was planted with a double dropper with 3½ feet between rows with two or three grains every 20 inches. It was lightly harrowed and scuffled once. There was an indication of root and cob rot in this entry and the purity and trueness to type left something to be desired.

Mr. R. Grace, Dorrigo, won third prize with a crop grown on red volcanic land two years under cultivation and following a crop of maize. It was ploughed in August, and was then disced and harrowed twice. Superphosphate at ½ cwt. to the acre was used. The crop was planted early in October with a single dropper, 3 feet between rows, two grains being dropped every 20 inches. The variety was a White selection that Mr. Grace has made himself, originating probably from Giant White. After the crop was up it was scuffled once and hilled. There was also in this crop a trace of root and cob rot.

The points awarded the North Coast competitors were as follows:—

North Coast Maize Championship.

Competitor.	Points awarded.						
	Cleanness of cultivation. (Max. 25 points.)	Germination or stand. (Max. 10 points.)	General appearance and condition, evenness, &c. (Max. 10 points.)	Freedom from insect pests and diseases. (Max. 10 points.)	Purity and trueness to type. (Max. 15 points.)	Estimated yield.*	Total.
J. Campbell, Kyogle ...	23½	8½	8	8½	11½	25½	85½
M. McBaron, Raleigh ...	23½	8	8	7½	10½	27	84½
R. Grace, North Dorrigo ...	24½	9	8½	7	11	15	75

* Coastal maize is estimated for yield at 3 points for every 10 bushels.

The Central Coast District.

Last year two societies only conducted competitions in this district—one each on the Macleay and Manning Rivers. This season two additional societies included the competition in their schedules, viz., the Hunter River and the Hawkesbury River societies. The Central Coastal rivers, however, suffered in two ways. A particularly dry spring was followed by flood rains later in the season, and many crops which otherwise would have competed were totally ruined. Finally three societies were represented in the championship.

The winner, Mr. E. H. Ducat, of Temagog, Macleay River, entered a crop of Fitzroy which had grown particularly well, and, being situated on a fairly high part of his alluvial land, had escaped the full damage that this part of his farm suffered. This land had been under cultivation approximately fifty years, and the previous crop was maize. Ploughing took place at the end of June, after which the land was harrowed and ploughed and again harrowed. Planting took place on 12th September with a single row dropper, the rows being 4 feet apart with three or four grains every 30 inches. When the crop was up it was scuffled three times and hilled.

The second-prize crop was entered by Mr. J. Greentree, Hawkesbury River, and was grown on alluvial soil which is said to have been cultivated for about one hundred years. The land was ploughed in July and was later harrowed, the maize being planted early in October with a single dropper, the rows being 4 feet apart, with three grains every 2½ feet. Yellow Hogan was the variety selected by Mr. Greentree, but it showed a good deal of variation from the correct type.

Mr. C. Shields, of Mt. George, entered a crop of Hickory King which came third. This was grown on alluvial soil which had been under cultivation for about sixty years, and followed a crop of potatoes and pumpkins. Ploughing took place in June. In August the land was harrowed, rolled, and disced and again ploughed. Planting took place early in December, when 1¾ cwt. of superphosphate per acre were used. Planting was done by hand in ploughed drills 3 feet 8 inches apart, and three grains were dropped every 27 inches. When the crop was up it was scarified four or five times and disc hilled. The type of seed was fairly good, showing, however, a slight interpollination. There was a trace of root and cob rot in this crop as in the two other entries in this district.

It will be noticed that not every competitor is using fertiliser. In the coastal districts particularly, the application of 1 cwt. of superphosphate will give a decided advantage to the crop, and it will be found also that those men who have once adopted this system will adhere to it.

Early preparation of the land for maize is an essential; the earlier the land may be ploughed the more satisfactory will be the return. It is necessary in these days of comparatively high production cost that an increased acreage return should be received, and early preparation and the correct cultural treatments are a big help in increasing the acreage returns.

The points awarded the Central Coast competitors were as follows:—

CENTRAL Coast Maize Championship.

Competitor.	Points awarded.						
	Cleanness of cultivation. (Max. 25 points.)	Germination or stand. (Max. 10 points.)	General appearance and condition, evenness, &c. (Max. 10 points.)	Freedom from insect pests and diseases. (Max. 10 points.)	Purity and trueness to type. (Max. 15 points.)	Estimated yield.*	Total.
E. H. Ducat, Temagog ...	23	9½	9	7	10	27	85½
J. Greentree, Freeman's Reach	22½	8	8½	6½	11	24	80½
C. Shields, Mount George ...	23	9	8	8	11	21	80

* Three points for every 10 bushels.

South Coast Championship.

The South Coast, in common with most of the other maize-growing parts of the State, suffered considerably in the spring and early summer from the shortage of rain. The season improved considerably early in 1929, and in consequence some particularly good crops were submitted for competition in the championships, though there was evidence throughout of the need for more care in seed selection.

The awards in the South Coast championship were as follows:—

South Coast Maize Championship.

Competitor.	Points awarded.						
	Cleanness of cultivation. (Max. 25 points.)	Germination or stand. (Max. 10 points.)	General appearance and condition, evenness, &c. (Max. 10 points.)	Freedom from insect pests and diseases. (Max. 10 points.)	Purity and trueness to type. (Max. 15 points.)	Estimated yield.*	Total.
J. B. D'Arcy, Bega	24½	9	9	7	11½	34½	95½
J. M. Lamond, Nowra ...	24	9	9	8½	11	33	94½
J. Bennett, Albion Park ...	24	8	8	9	12½	30	91½
R. T. Goward, Kiah, Eden ...	23½	8½	9	8½	10	25½	85
J. Graham, Kangaroo Valley	24	9	8	9	11	24	85
L. [illegible]ollett, Moruya ...	24	9	9	9	10	22½	83½
J. A. Martin, Pambula ...	21	8½	9	7½	11	24	81

* Three points for every 10 bushels.

The winning crop, submitted by Mr. D'Arcy, of Bega, was an exceptionally good one. The variety was Funk's Yellow Dent and the cultural operations had been thorough. The seed was sown rather thickly on particularly heavy-yielding flats, and thus its high-yielding capabilities were not detracted from. A few points were lost through root and cob rot, and in addition there was a trace of smut. The type of Funk's Yellow Dent was fairly good, but more rigid selection is necessary. The land on which the winning crop was grown has been fifty years under cultivation, the previous crop having been lucerne. It was ploughed in August very deeply, later harrowed, rolled, then cultivated and cross cultivated. It was planted on the 17th October with a single row dropper, with 3 feet between the rows and two grains every 10 inches in the row. After the crop was up it was harrowed and scuffled as required.

Mr. J. M. Lamond, of Nowra, came second with an entry of Hickory King. This was also a particularly good crop and planted very thickly. The type of Hickory King was reasonably good, although it showed a

distinctive mixture of other white types. This crop was particularly disease free. The land had been under cultivation for about four years; the previous crop was sorghum. The land was ploughed very deeply and then harrowed and rolled; the rows were 2 feet 9 inches apart and two grains were dropped every 15 inches. The crop was later scuffled three times.

Mr. J. Bennett, of Albion Park, was placed third with Hickory King, also planted on land that had been under cultivation for four years; it followed a crop of oats. The land was ploughed in August, then rolled, disced, and rolled again. The crop was planted in January, a single-row dropper being used following a furrow opened with a plough; the rows were 3 feet 8 inches apart and three grains were dropped every 2 feet. The land was later scuffled and lightly hilled.

The varieties that might be recommended for the South Coast are briefly:—Funk's Yellow Dent, Boone County White, Yellow Moruya, Bega Yellow, with Hickory King for another white variety; Fitzroy throughout for green feed and silage, and grain in the longer season districts.

General Remarks.

Indications of the presence of root, stalk, and cob rot diseases were found more or less throughout the State. To avoid this condition and to keep a certain amount of control over these diseases, growers are strongly urged to carry out, as far as their own particular growing and harvesting conditions will permit, the following suggestions:—

When procuring seed cobs in the paddock, care should be taken to avoid those from stalks that are broken down or bent, or those that have prematurely ripened or grown on stalks which pull up easily from the ground. When selecting seed in the barn, cobs that contain any split, discoloured, or mouldy grain should be discarded. Take care, in addition, to select cobs of weight with well filled and sound grain rather than those on which the grain is loose and shrivelled and the cobs light. This disease would quickly reach more serious dimensions if neglected.

Passion Fruit Yields on the North Coast.

It is being asserted in some quarters that a yield of 200 bushel cases of passion fruit per acre is a fair average yield under North Coast conditions. This estimate is greatly exaggerated and is, no doubt, based on the fact that some five years ago yields of that quantity were obtained in the Tweed River valley. It is most unreasonable, however, to assume that what can be achieved in that particular district is also possible anywhere on the North Coast, from Kempsey to the Tweed Heads. Moreover, in recent years, brown spot and woodiness have substantially reduced yields, and the grower, who, to-day, is harvesting 140 bushel cases per acre should be satisfied that he is obtaining a fair average crop. Even to obtain that quantity, he will need to have a fair knowledge of proper cultural practices and disease control measures, and, in addition, be favoured with a normal season.—H. W. Eastwood, Fruit Instructor.

Maize Improvement in New South Wales.

Maize improvement work by the Department of Agriculture in New South Wales has been recently reorganised by reason of the breeding work having been dissociated from the general instructional work on the cultural side. The breeding work is now controlled by the Plant Breeding Branch, which is undertaking the improvement of the varieties Fitzroy, Leaming, Large Red Hogan, Wellingrove, and Funk's Yellow Dent, which are among the leading varieties grown in the State. This work is being conducted only at the main coastal and tableland experiment farms. Mass selection for the improvement of other varieties, and general instructional work on maize culture are the duties of the officer on the staff of the Field Branch specialising in this crop.

The improvement work at the experiment farms is being mainly carried out by two methods—a modified ear-row test and the system of selection in self-fertilised lines. Some noticeable improvement has already been effected by the ear-row test method, and this has been turned to practical account by the distribution of improved seed of the above varieties over a wide range of the maize belt in New South Wales. It is considered that the maize improved by this method has now reached a certain standard, and that the yield can only be maintained or increased slightly by the application of this system of improvement, which is, however, being continued for this season, and the seed is still being distributed from the experiment farms. But if any further marked increase in yielding capacity is to be made with these varieties, it is felt that it can only be done by the method of breeding in self-fertilised lines, and this method of breeding has, therefore, been put into operation at the experiment farms by the Plant Breeding Branch.

The aim is to eliminate the weaknesses and lethal factors which are largely hidden and bolstered up by their heterozygous condition which is maintained through promiscuous natural cross-fertilisation, and to isolate by continued self-fertilisation pure lines which retain, as far as possible, the favourable factors that are responsible for good growth and yield, and to build these into a synthetic variety which, by reason of these factors, will be a marked improvement on the original variety.

From the experience of maize breeders in America it is known that a marked improvement can be obtained in this way, but there yet remains to be indicated how this improvement can be effectively rendered more or less permanent in a practical way. It has been shown in America that the improvement secured by this means is necessarily of a temporary character unless recourse is had to the securing of similar seed from the same source every year, and this method of improvement, therefore, has the burden of a departure from easy practicability thrown upon it, which militates against its best success.

In undertaking the improvement of maize by this method, the Department aims to evolve a superior yielding variety or strain which can be expected to maintain its high yielding capacity for a number of years and whose seed can, therefore, be grown and increased in an ordinary practical way by farmers.—H. Wenholz, Director of Plant Breeding.

If you find the *Agricultural Gazette* of assistance to you in your work, so will your neighbour—loan him your copy.

Fodder Conservation Competitions.

SOME FURTHER REPORTS.

THE R.A.S. NORTH-WEST CHAMPIONSHIP.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.

IN spite of a succession of abnormally dry seasons, two societies in the north-west, viz., Gunnedah Agricultural Society and the Boggabri District Agricultural Bureau, were successful in their initial efforts to organise competitions for conservation of fodder.

Fodder conservation should be of special value in the north-western districts, which appear to experience an alternation of feast and famine periods. The soils are so fertile that very prolific growth is made in favourable seasons, and, unless an effort is made to conserve it, the fodder is wasted. The rank growth is not of great value for sheep feeding, and is best used for silage, while the new growth made by the crops or natural pasture, which have been cut, will be more suitable and of greater food value for sheep grazing.

Judging was carried out on 5th June, under the same scale of points as that used for the competitions in other inland divisions,* and the one prize that was awarded was won by Mr. L. G. Pryor, of Gunnedah. The details of the points scored are as follows:—

TABLE of Awards, North-west Championship.

Society.	Name and Address.	Suitability.	Quality.	Location.	Protection.	Economy of Production.	Carrying Capacity.	Total.
	Maximum Points ...	25	35	10	35	15	60	180
Gunnedah...	L. G. Pryor, "Eriston," Gunnedah	19	27	9	29	10	41	135
Boggabri ...	J. B. White & Sons, "Braymont," Boggabri	21	30	9	31	12	25	128

Of the compact property of 488 acres, Mr. Pryor uses 330 acres for wheat cultivation, 10 acres for lucerne, and 20 acres for fodder crops, chiefly rape, leaving a balance of only 128 acres in pasture. Yet, at the time of judging, the stock carried was a little better than one sheep per acre, and as the sheep are chiefly ewes for fat lamb production, the addition of lambs later will increase the flock to such numbers that the average for the year can be taken as approximately one and a quarter sheep per acre. The carrying

* The scale of points used in judging is set out in last month's issue of the *Agricultural Gazette*, p. 549.

capacity of the land under natural pasture is estimated at one sheep per acre, and although two-thirds of the property is used for the cultivation of wheat, the number of stock carried has not decreased, but, on the other hand, has considerably increased, as the result of providing fodder crops for grazing. Such heavy stocking, however, can only be safely practised when ample reserves of conserved fodder are available to maintain the stock in condition over periods of shortage.

The stored fodder consisted of one pit containing 109 tons of silage of excellent quality made from Skinless barley, 66 tons of hay (mostly wheaten and Sudan grass, stacked in a shed) and 1½ tons of oats and Sudan grass seed contained in a mouseproof shed. The total quantity of fodder was sufficient for the feeding of the stock equal to the carrying capacity of the holding for only two-thirds of the stipulated period.

Messrs. White and Sons' fodder was not sufficient in quantity for one-half of the period, but in other respects it scored higher points than the winner. Further details regarding this competitor's entry are given in the report of the district competition, which appears on page 659 of this issue.

General Remarks.

The absence of lucerne hay in this competition is rather surprising, as the fertile soils and summer rains experienced in the north-west should be eminently suitable for the cultivation of lucerne. Not only will it provide excellent green fodder for grazing, but it should also be possible to obtain two or three cuts of hay in a season. It is one of the best fodders for conservation, and it is invaluable for supplementing silage and providing a balanced ration when feeding during dry periods.

The attention of stockowners in the north-west might be directed to the value of the galvanised-iron tank for the conservation of grain. Nothing can compare with it for low cost and efficiency, and, if properly constructed, the grain is safe from damage by weather, mice, and other pests. Provided the grain is stored in the tank in a dry condition, and the entrance of moisture prevented, there is no danger of weevil infestation. Should, however, weevils make an appearance they can be readily destroyed by fumigating with carbon bisulphide. The cost of an oat silo has frequently been returned in less than a year as the result of the increase in the market price of oats during the period of storage.

Gunnedah and Boggabri Competitions.

J. A. O'REILLY, H.D.A., Agricultural Instructor.

The Pastoral and Agricultural Association's committee at Gunnedah and the Braymont Agricultural Bureau, through the Boggabri Sub-district Council, co-operated with the Royal Agricultural Society and the Department of Agriculture in conducting fodder conservation competitions this year. It is hoped that similar organisations throughout the north-west will fall in line next year, and include these competitions as a phase of their

work. The numbers of entries at Gunnedah and Boggabri were small, but it is most encouraging for an initial effort, and, no doubt, when the competition is better understood and the benefits accruing from it are more fully realised, the response will be as great as in connection with the crop competitions.

TABLE of Awards, Gunnedah Competition.

Competitor.	Suitability and Quality.		Location and Protection.		Economy of Production.	Carrying Capacity.	Total.
	(a)	(b)	(a)	(b)			
Maximum Points...	25	35	10	35	15	60	180
1. L. G. Pryor, Gunnedah	20	26	9	25	14	57·8	151·8
2. Hathway & Son, Curlewis ...	20	22	9	25	13	60	149
3. F. Foster, Gunnedah	22	20	9	22	13	38·6	124·6

The Fodders Conserved.

L. G. Pryor, Eriston, Gunnedah.—This competitor carried off the championship honours, and particulars of his entry are given in the report of the North-west Championship.

Hathway and Son, Woodleigh, Curlewis.—The property consists of 830 acres, of which 425 acres are cropped with cereals, 130 acres fodder crops, 15 acres lucerne, and 260 acres of natural pasture. On the property are carried 500 sheep, seven horses, and eleven head of cattle, being equivalent to 608 sheep. The amount of fodder conserved was 420 tons silage, 49 tons cereal hay, and 1½ tons of grain. This is equivalent to 175.1 tons of lucerne hay, which would provide for the feeding of 700 sheep. The amount of fodder necessary to meet requirements would be 73½ tons hay, 147 tons silage, and 13.3 tons of grain. The fodder conserved showed a surplus of silage and a deficiency in hay and grain. The silage consisted of three pits, one of wheat and oats combined, and two of oats. The quality was good and the material well protected. The hay consisted of 34¾ tons wheaten hay and 14¼ tons of Sudan grass stored in sheds. The grain consisted of wheat in bags and stored in a shed.

F. Foster, Mary's Mount, Gunnedah.—The holding consists of 893 acres, of which area 413 acres are cropped with wheat and oats, and 480 are under natural pasture. The number of stock carried is 800 sheep, fourteen horses, and four head of cattle. This is equivalent to 908 sheep. The amount of fodder conserved was 300 tons of silage, 70 tons of hay (cereal), and ½ ton grain. This amount of fodder is equal to 147 tons of lucerne hay, and is sufficient for 588 sheep. The amount of fodder necessary to meet requirements would be 113 tons of hay, 226 tons of silage, and 21 tons of grain. The conserved fodder in this case was inadequate for the number of stock carried. There was a surplus of silage, a slight deficiency in hay, and a large

shortage in grain. The hay consisted of three stacks, two of which were oaten and one wheaten. This was harvested last year, and the quality was prime. The silage was conserved in pits, and was made from a crop of Mulga oats grown in 1928. The grain consisted of ½ ton of wheat in bags.

TABLE of Awards, Boggabri Competition.

Competitor.	Suitability and Quality.		Location and Protection.		Economy of Production.	Carrying Capacity.	Total.
	(a)	(b)	(a)	(b)			
Maximum Points...	25	35	10	35	15	60	180
1. J. B. White, Boggabri	20	30	9	30	13	40·1	142·1
2. S. K. Rabbitts, Boggabri ...	23	26	9	30	13	22·8	123·8
3. A. S. Austin, Boggabri	23	28	10	30	15	14·3	120·3

J. B. White and Sons, Braymont, Boggabri.—This property consists of 1,280 acres, of which 400 acres are sown to wheat, 44 acres to fodder crops, 208 acres fallowed, and 628 acres under natural pasture. The number of stock carried is 600 sheep, twenty-four horses, and six head of cattle, which are equivalent (according to the scale of points) to 780 sheep. The amount of fodder conserved was 213 tons of silage, 47 tons of cereal hay, and 14 tons of grain (wheat and oats). This amount of fodder is equivalent to 130.2 tons of lucerne hay, and is sufficient for 521 sheep. The amount of fodder necessary to meet requirements would be 194.2 tons of silage, 97.1 tons of hay, and 18.2 tons of grain. The fodder conserved in this case was inadequate for the number of stock carried. There was a slight surplus of silage, a shortage of hay, and a slight shortage in the amount of grain conserved.

The hay, stored in two stacks, was of prime quality and in a good state of preservation. The silage was conserved in pits, and was made from a crop of oats grown last season. The grain portion of the conserved fodder was made up of sixteen bags of oats and 160 bags of wheat. This was stacked in a shed.

S. K. Rabbitts, Nandewar, Boggabri.—Of the 2,590 acres in this property, 1,872 acres are under natural pastures, 679 acres are sown with wheat, and 39 acres are under lucerne. The number of stock carried is 4,000 sheep, fourteen horses, and 113 head of cattle, equivalent to 4,762 sheep.

The amount of fodder conserved was 656 tons of silage, 230 tons of wheaten hay, 55 tons of lucerne hay, and 13.4 tons of grain. Expressed in terms of lucerne hay, this amount of fodder represents 453.7 tons, being sufficient for 1,815 sheep. Actual requirements would be 1,196 tons of ensilage, 598 tons of hay, and 108 tons of grain. In this case sufficient fodder has not been conserved for the number of stock carried, occasioning

loss of points under the heading of carrying capacity. The silage was conserved in pits, the quality was good, and the covering ample. It included eight pits of Sudan grass, one of saccaline, and five of lucerne. The 230 tons of wheaten hay was baled, and 150 tons were stored in a shed; the remainder was stacked in the open and covered with lucerne. The quality of the hay was good. The 48 tons of lucerne hay (baled) was of good quality, stacked in the open, and suitably covered. Seven tons of loose lucerne hay was of fair quality. The grain section of the conserved fodder consisted of 500 bushels of wheat stacked in a mouseproof shed.

A. S. Austin, Therribri, Boggabri.—This holding consists of 15,000 acres, 450 acres of which are under lucerne and the remainder is natural pasture. The number of stock on the property is 23,000 sheep, seventy horses, and 120 head of cattle, equivalent to 24,140 sheep.

The amount of conserved fodder was 1,644 tons of lucerne silage and 986 tons of lucerne hay. This is equivalent to 1,534 tons of lucerne hay, and sufficient for 6,136 sheep. Actual requirements for 24,140 sheep would be 3,007 tons of hay, 6,014 tons of silage, and 564 tons of grain. The amount of fodder conserved was inadequate for the number of stock carried, which fact occasioned loss of points under the heading of carrying capacity. Although no grain was conserved, this deficiency was largely made up by the lucerne hay. The silage was conserved in pits suitably located on the holding. With the exception of 198 tons, the lucerne hay was baled. The quality of the baled material was good, but the stacks of loose hay were fair, being the first cut of the 1928 season. Four hundred and eighty tons of baled hay was stored in stacks each containing about 20 tons; the remainder was stored in a shed.

Comments.

From the point of view of protection of fodders, grain can be stored more efficiently and safely in galvanised-iron tanks, and damage done by mice to hay in stacks can be minimised by the erection of a galvanised-iron barrier. This, no doubt, entails some expense in the first place, but the work is permanent. Silage in pits is safe from general deterioration, provided ordinary care has been exercised in the selection of a site.

THE R.A.S. SOUTH COAST CHAMPIONSHIP.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.

The dairy-farmers on the South Coast have led the way this season in regard to fodder conservation, more societies being represented in the championship competition than in any other division of the State, and the average number of entries in the district competitions was also greater. Moreover, they are setting a fine example to dairy-farmers in other coastal districts in providing fodder reserves for the feeding of their dairy herds during periods of shortage. More and more is it being realised that in order to meet increasing costs of production there is a need to improve the production from our dairy farms by more intensive farming. Progress is

being made in the improvement of pasture and the cultivation of fodder crops, but the more the carrying capacity of a property is increased the greater is the necessity for adequate fodder reserves, in order to ensure that any depletion in the production of the pastures and growing crops can be immediately supplemented. Not only during the winter months and periods when pastures are sparse as the result of dry spells are conserved fodders essential to maintain a continuity of production, but they are an excellent standby in cases of emergency, when the pastures may be destroyed as the result of fire, flood, or pests. The latter was well demonstrated when bush fires raged through the Bega district early in the year, and consumed hundreds of acres of grass.

District competitions were organised by six agricultural societies, namely, Albion Park, Bega, Camden, Dapto, Moruya, and Tilba Tilba. This is an increase of one on the initial effort of the previous year, all the societies competing last year again being represented, and. in addition, the Dapto Society which made a late decision to conduct a competition. In view of the most unfavourable season for the production of crops suitable for conservation, this result is most encouraging, and the great interest and enthusiasm displayed augurs well for greater success in the future.

The conditions and scale of points for judging the competition differ from those adopted for judging competitions in inland divisions. and are as follows:—

CONDITIONS.

Fodders eligible for conservation to be concentrates (including all grains); or roughage —as hay (*e.g.*, lucerne, oaten, wheaten, clover, grass), silage; and any other fodder suitable for conservation—all to have been produced on the land owned, leased or held on shares by the competitor.

Fodder conserved over a period of more than four years will not be eligible.

SCALE OF POINTS FOR JUDGING—COASTAL AREAS.

		Points.
1. *Suitability and quality of fodder* ...		65
(*a*) Judged according to the suitability of fodder or combination of fodder for the purposes for which they are required ...	30	
(*b*) Judged as to appearance, apparent palatability, and nutritive and feeding values ...	35	
2. *Location and protection* ...		40
(*a*) Locality.—Location of the site, having regard to fire, flood, economy in feeding, and general access ...	20	
(*b*) Protection.—Protection from weather, pests, stock, fire, and general deterioration ...	20	
3. *Economy of production* ...		25
Including land value, production, storage, and feeding costs.		
4. *Carrying capacity* ...		60
Quantity for the requirements of competitor's holding to be based on the carrying capacity of the holding (when improved and under natural pasture). The maximum amount considered to be competitor's requirements per cow to be 20 cwt. lucerne hay or its equivalent in feeding value (1 cwt. lucerne hay=1½ cwt. cereal hay = 3 cwt. silage = ½ cwt. grain).		
5. *Quantity of fodder in excess of requirements* ...		10
At the rate of 5 points for surplus fodder equal to quantity required for the holding.		
Total ...		200

Judging was commenced at Bega on 10th June, and was completed at Camden on 1st July.

TABLE of Awards.—South Coast Championship.

Society.	Competitor.	Suitability.	Quality.	Location.	Protection.	Economy of production.	Carrying capacity.	Quantity in excess of requirements.	Total.
1. Camden ...	Porter Bros., May Farm Camden.	28	31	19	19	21	60	4	182
2. Moruya ...	N. S. Bate, "Old Bodalla," Bodalla.	25	32	19	19	21	56	...	172
3. Albion Park	A. A. Gorrell, "Glen View," Yallah.	20	25	17	17	22	60	1	162
4. Bega ...	Guthrey Bros., "Elmgrove," Bega.	28	32	19	19	21	33	...	152
5. Tilba Tilba	A. and W. Southam, "Couria Creek," Tilba.	15	33	17	19	22	44	...	150
6. Dapto ...	J. McPhail, "Glenlee," Dapto	20	32	18	19	22	11	...	122

Particulars of Successful Competitors' Entries.

Messrs. Porter Bros. were successful in winning the championship with fodder which was more than sufficient in quantity, according to the carrying capacity of the property, and of a high standard of quality, permitting a satisfactory balanced ration to be fed to the dairy herd. It was adequately protected against deterioration and well located for the expeditious feeding of the herd. May Farm, together with a small lease for dry cattle, totals 417 acres, of which 35 acres are under lucerne, 15 acres are sown with oats, and, during the past season, there were 20 acres of maize and 15 acres of sorghum, the balance of 332 acres being pasture. The fodder consisted of 123 tons of silage, 48 tons of which was chaffed maize contained in a bricked pit which was under cover close to the feeding stalls, and 75 tons was chaffed sorghum in a trench silo also located conveniently for feeding; also 110 tons of lucerne hay which had been conserved each year since 1926 and stacked in three sheds. The total quantity of fodder was sufficient for feeding 161 head of cattle for the stipulated period, as compared with the estimated total carrying capacity of the holding of eighty-seven head; or, in other words, the fodder reserves were ample for a full ration to be fed for a period of nearly six months to the number of cattle that the property would carry if under natural pasture.

It was chiefly in respect of the large quantity of fodder provided and the proportion of lucerne hay that the exhibit of Messrs. Porter Bros. excelled, and were thus enabled to carry off the championship with a good margin of points.

Mr. Norman Bate, who won the second prize, is a very keen enthusiast on the subject of fodder conservation, and was successful last year in winning the third prize. The area of his holding is 680 acres, of which 337

acres are under pasture, 20 acres under maize, 15 acres under oats, and 8 acres of lucerne. The total quantity of fodder was 182 tons silage made from chaffed cornstalks, 19 tons oaten chaff, 14 tons lucerne, and 8½ tons maize, of which some was in cob, some shelled, and some ground ready for feeding. The total quantity was a little short of requirements, and although there was a good variety of fodder, the proportion of lucerne hay was too low to allow a satisfactory balanced ration to be provided. The silage was conserved in two overhead silos, one constructed of concrete bricks and the other with reinforced concrete, and they were situated together adjacent to the feeding stalls. The hay, chaff, and grain were all under cover and well protected, and placed conveniently for feeding.

Mr. A. A. Gorrell succeeded in winning the third prize and thus effected an improvement on his position in last year's competition, in which he occupied fourth place. His success is all the more creditable as it is only in recent years that he has made a practice of conserving fodder. His holding is 375 acres in area, including 135 acres of scrub, which for grazing is practically valueless. Sorghum is grown on 10 acres, maize and oats on 20 acres, and lucerne on 4 acres. The balance is under pasture.

The fodder consisted of 140 tons silage in two trench silos, of which 117 tons was whole maize and sorghum stalks and 23 tons of chaffed sorghum; there were also 7 tons of lucerne hay and 3 tons of maize grain. The total amount of fodder was sufficient for the feeding of sixty head of cattle, which is seven more than the estimated carrying capacity of the holding.

General Remarks.

Every competitor has recognised the value of maize silage as the foundation of their conserved fodders. The advantages of silage as a fodder for milking cattle are many; not only is it the nearest approach to pasture by reason of its succulence, palatability, and digestibility, but advantage can be taken of summer growing crops like maize, which return large yields of fodder. An average maize crop when converted into silage is capable of feeding more than four times the number of cattle that a similar area of average pasture is capable of carrying. Moreover silage is secure from damage as the result of the weather conditions, fire, or pests.

While silage is of such importance to the dairy-farmers, still it should not be regarded as a perfect ration in itself for feeding to dairy cattle. It is deficient in protein, or flesh-forming nutrients, and requires to be supplemented with a fodder rich in protein in order to supply a well-balanced ration, and lucerne hay is considered to be the most suitable for the purpose. Lucerne can be produced on most South Coast farms, for where satisfactory river flats are not available there are low-lying portions of the farm where lucerne can be successfully grown, while on much of the high country satisfactory results would be obtained. In conserving lucerne hay it is advisable to stack the hay while it still contains a little moisture, in order to avoid the loss of leaf which is the most valuable part of the lucerne hay. Brown sweated hay is thus produced, which is free from dust

and for which cattle show a decided preference. An added advantage is that the hay packs together better and does not occupy as much shed space as dry hay; furthermore, the harvesting is expedited and thus there is less risk of damage by rain.

By the aid of conserved fodders, Mr. Gorrell has found that the carrying capacity of his farm has increased and the milk production considerably improved. He states that the daily supply has increased from four to ten cans since he practised fodder conservation. His silage is all conserved in trench silos, the batters of which he excavates by means of pick and shovel. This is not recommended, for, although the capacity of the pit may be increased, it is effected at a much greater cost for the pick and shovel work than when the plough and scoop are employed, and, furthermore, the batters are an advantage in facilitating the operations of filling and emptying the pit. The packing of the fodder in the pit is also materially assisted if the loads can be drawn into the pit and over the fodder.

Bega, Tilba, and Moruya Competitions.

JOHN L GREEN, H.D.A., Agricultural Instructor.

Local competitions were conducted by the agricultural societies at Bega, Tilba, and Moruya. It was hoped that the number of competitions, which was the same as last season, would have been increased, but the harsh summer can, in a large measure, be blamed for the failure to extend the competition to other centres.

The conservation of fodder should be one of the main considerations of dairy-farmers in this district, more particularly those situated on hill country. However, it appears peculiar to have to state that, with few exceptions, it is these particular farmers who do not worry in this direction. In nearly every instance farmers on the better-class flat country have conserved a certain amount of fodder. This is well exemplified by the fact that of the fifteen entrants in the three competitions only two have no flats, and the remainder have upwards of 20 acres each—in some cases the major portion of the farm is made up of these richer flats. It is not that crops cannot be grown on the hill land, but apparently that these particular farmers are under the impression that fodder crops suitable for conserving can only be profitably grown on the better-class country. Most of the crops mentioned later on in this report will grow successfully on the granite hills in this district, and the matter of being prepared for such another drought as that recently experienced, should seriously engage the attention of dairy-farmers.

Quality and Quantity Equally Essential.

If satisfactory grazing is not available, dairy cattle require a type of fodder which cannot be found in any one crop. Quantity and quality are equally essential in any ration for a milch cow, and, with certain reservations, crops produced on the farm may all enter into a satisfactory ration.

It is a well-known and proven fact that the best feed obtainable for dairy cattle is the young growth on a well-established and complete pasture. When this is unobtainable, then, and not until then, is it economically sound to feed the herd. The feedingstuffs need not necessarily take the form of stored fodder, but crops sown for grazing, such as lucerne, oats, Japanese millet, &c., may be utilised. When these sown crops are failures, or their use cannot be availed of owing to some unavoidable circumstance, such as floods, then is the time the true value of a sound fodder conservation policy is realised.

If this fodder is not available factory returns will slump considerably, or, in an attempt to retrieve the position, a farmer may be tempted to purchase feed, which, although a sustaining feed, is not comparable to other classes of fodder, such as silage, which may be conserved on the farm. To supply the quantity portion of a ration there is no better fodder conservable than silage. It is outstanding in value, and once a farmer invests in a silo, which, on the score of cost, appears to be the one objection to silage making, it is safe to say that it will never, unless under most stringent conditions, be found empty.

It was pleasing to see Mr. H. J. Bate erecting a silo at Tilba capable of holding over 100 tons. Mr. Bate already has one erected and full of silage. Two other farmers signified their intentions of erecting additional silos.

The premier crop for silage on the coast is maize, but, if for any reason this crop cannot be grown, it may be replaced with others. Sorghum is an excellent substitute, and even the winter cereals, *e.g.*, oats, &c., may be used. If a silo is not on the farm then some other form of storing a "bulk" food must be found. but this is rather difficult. Sorghum, cut when the frost has just touched it, may be satisfactorily stooked either in the field or in the barn. However, this cannot be considered as fodder conservation in the true sense, as sorghum in this form can, at the most, be saved only for a few months. As mentioned before, replacing silage as the bulk portion of any fodder conservation scheme is rather difficult.

Grow More Lucerne.

In respect to the quality portion of a ration of conserved fodder, there is only one crop—lucerne. This crop may be replaced with protein concentrates, such as linseed cake, cottonseed cake, &c., but these cannot be produced on the farm. Lucerne ranges far ahead of any crop as an essential portion of the feed ration. It is this crop that is looked for most anxiously when judging these fodder conservation competitions, as lucerne is a crop that can be grown by any farmer, whether he be on "hill" land or on the flats. The old contention that lucerne could only be grown on alluvial flats has repeatedly been disproven by farmers all over the State, and it behoves any farmers who have not a few acres under this most valuable crop, either for grazing or for hay, to make amends in this direction. It may not be possible always to obtain a cut from lucerne, but it

would be a very disastrous season when at least one fair cut for hay was not made. On the average it is safe to presume that at least two cuts of hay per season would be obtained on the average granite hills of this district. Farmers value highly any clovers or trefoil seen in the pasture. Lucerne has just as high a value as these other legumes, it produces greater bulk, and is the only legume in this State that lends itself to successful haymaking. Any farmer who has silage and lucerne hay may rest assured that he has conserved the two fodders that are of the greatest consequence in milk production during a dry spell.

Other fodders that may be successfully conserved by farmers in this district, such as cereal hay or maize grain, are valuable in certain directions, but are not as important as those previously mentioned. Those dairy-farmers on the poorer type granite soils who believe that continuous cropping with maize will destroy the fertility of the soil could easily make a strong point of conserving fodder in the form of cereal hay. In passing, it might be as well to mention that continuous cropping of this poorer country, even if it be only with grass and heavy grazing, will impoverish the soil in time, and a rotation of crop paddocks is desirable.

Of the fifteen competitors in these competitions fourteen had silage, ten lucerne hay, six oaten hay or chaff, twelve maize, and five green sorghum stooked. In two instances at Moruya, farmers had large quantities of sorghum seed which they were unable to dispose of, and which it was their intention to utilise as the grain portion of a ration.

The Winning Entries.

Messrs. Guthrey Bros.—The winner of the Bega competition, Messrs. Guthrey Bros., repeated their success of last season. With 140 tons of silage, 50 tons of lucerne hay of very good quality, and 3 tons of maize, all well conserved and protected, they must feel in a fairly secure position on a property noted for its carrying capacity. These farmers make silage and lucerne haymaking their forte, and it was only due to the drought and bush fires that considerably more of both were not conserved.

Mr. N. S. Bate, winner of the Moruya competition, farms an area of 680 acres on the Old Bodalla estate. He goes in thoroughly for fodder conservation, and this year he bettered his position in the championship by securing second prize, being third the previous year. His was a remarkably fine entry, and with an increased quantity of lucerne hay, he would have had an almost perfect entry on the score of quality for a drought ration. Full particulars in connection with Mr. Bate's entry are given in the report of the South Coast Championship, which is published in this issue.

The other entrants in the Moruya competition also made a very fine showing; each one had a goodly quantity of maize grain, four being over 250 bushels. Also each farmer had his shed of lucerne hay, all stating that with a better season the lucerne hay stored would have been considerably augmented.

Messrs. A. and W. Southam, winners of the Tilba competition, gave an example of how a farm with a relatively small area can succeed in winning one of these competitions. Their farm has an area of 100 acres, 25 acres of fair flat and 75 acres of hill. On this farm they succeed each season in filling the silo and growing a fair quantity of sorghum to tide them over the early part of the winter. To date lucerne has not been successfully grown, although it is their intention to sow an area during next autumn.

Tilba is noted as the home of silos on the South Coast, and in this rich pocket of country, where over forty farms are situated, there is an average of one silo per farm. Lucerne is not grown in this district to the extent it should be, although there are only a very few areas where it would not grow.

Judge's Remarks.

These fodder conservation competitions serve a very useful purpose in demonstrating the methods adopted and fodders grown by those farmers who practically carry out the oft repeated advice of farming for a dry year or drought. It is anticipated that next year the number of districts conducting these competitions will be increased, and also the number of entrants in each district will be greatly in excess of the number this year.

Camden, Albion Park, and Dapto Competitions.

R. N. MAKIN, Senior Agricultural Instructor.

Three agricultural associations successfully conducted local fodder conservation competitions this year, namely, Camden, Albion Park, and Dapto, and but for the dry weather conditions during the spring and early summer causing crop failures among the early-sown crops, other associations, undoubtedly, would have staged similar competitions, as there are several districts where farmers are quite alive to the value of fodder conservation.

The Camden and Albion Park Associations, which successfully conducted competitions last year, were again supported by their members, and the Dapto Association is to be congratulated for having carried their competition through in spite of the bad season.

In the Camden group there were six entries, the winners being Messrs. Porter Brothers, of May Farm. These farmers made a very good showing with their supplies of silages and lucerne hay, one noticeable feature being the excellence of the location and protection of the fodders. It was to the credit of Messrs. Porter Bros. that they carried off the Royal Agricultural Society's Championship for the South Coast. Details of their holding and the amounts and varieties of fodders conserved are given in the report of the South Coast Championship, which is published in this issue.

Among the Camden entries, a quantity of good-class silage, lucerne hay, and maize (grain) was seen, although supplies were not as large as last year.

Of the six competitors supporting the Albion Park Agricultural Association, Mr. A. A. Gorrell, who won the local competition last year, was able to hold his place this year and also gain third place in the championship. The fact that this entrant held quantities of silage in pits and also supplies of lucerne hay and maize sufficient to meet his requirements afforded him an advantage over other competitors. Readers are referred to the report of the South Coast Championship for further particulars regarding Mr Gorrell's entry.

In the Dapto group, Mr. J. McPhail, a dairy-farmer who has been interested in fodder conservation for twenty years, gained the position of honour among the five competitors in the local competition. His supplies of silage and maize, although not up to his usually high standard on account of the adverse season, were very creditable.

Comments.

There are several matters on which some farmers are not clear regarding the conditions governing these fodder conservation competitions, and among these may be mentioned the following:—

1. Crops standing in the paddock, such as sorghum and maize, are not classed as conserved fodder.
2. Maize harvested for grain is taken into consideration as long as it is in the crib or barn, and it can be either shelled, husked, or unhusked maize.
3. The carrying capacity is reckoned on the total holding of the competitor.

MURRUMBIDGEE P. AND A. ASSOCIATION'S COMPETITION.

L. JUDD, H.D.A., Manager, Temora Experiment Farm.

It is to be regretted that such a progressive district, and one possessing the potentialities that Wagga does, should only submit three entries for judging, the centres represented being Wagga, Uranquinty, and Borambola.

Fodder conservation should go hand in hand with pasture improvement in order that maximum returns and a greater measure of security may follow the methods adopted to increase the carrying capacity. It is not necessary to await a drought in order to reap the reward of forethought in the line of fodder conservation; its advantages are apparent in the minor dry spells which are experienced from time to time in the rural districts of this State.

Messrs. A. Brunskill and Sons have ably demonstrated what can be achieved in this direction by tiding stock over certain periods which has resulted in their being marketed at the correct time. Lack of reserves would have resulted in financial loss exceeding many times the expenditure incurred in the storage of the necessary fodder.

The Winning Entries.

The winner, Mr. A. Brunskill, of "Allonby," again submitted an entry deserving of highest praise. A pleasing feature was the system of standardisation in relation to the measurement of stacks and silage pits, with the result that all closely approximate an even tonnage. The stacks are neatly aligned across the paddocks and consequently present a pleasing appearance. Care is exercised that suitable distance separates them, so that in the event of fire only one stack would be liable to loss. Dunnage and thatch are used to reduce deterioration to a minimum. The height of the walls of the stacks results in a measure of compaction, which, in turn, reduces vermin infestation as compared with stacks of low-wall height. The quality of all produce can be pronounced excellent, which is evidence of capable management.

The fodder submitted comprised wheaten, oaten, Sudan grass, and lucerne hay, with ample supplies of silage to balance the ration. There were also supplies of baled hay and chaff securely stored in a shed.

Second place was secured by Mr. Lewington. This exhibit contained some excellent quality produce, garnered during the past harvest, and showed a marked improvement in quality compared with that previously submitted. The exhibit consisted chiefly of oaten and wheaten hay, together with straw stacks and a quantity of chaff stored in sheds. The one pit of silage was not eligible for inclusion in the competition on account of its having been stored for longer than the stipulated period.

Mr. Lewington has a vast reserve of fodder on the property, which will provide a very valuable saleable surplus when opportunity offers for its disposal.

Third place was secured by Messrs. A. Brunskill and Sons, of Borambola. This exhibit consisted chiefly of lucerne silage, which was of excellent quality, well preserved and protected. Lucerne and wheaten hay comprised the remainder of the exhibit.

TABLE of Awards, Murrumbidgee P. and A. Association Competition.

	Suitability of Fodder. For Requirements.	Appearance, Palatability, Feeding Value, &c.	Location of Site.	Protection.	Economy of Production.	Carrying Capacity.	Total.
Maximum Points...	25	35	10	35	15	60	180
Mr. A. Brunskill, "Allonby."	22	33	8	31	14	60	168
Mr. A. Lewington, Uranquinty.	18	31	7	30	13	60	159
Messrs. A. Brunskill & Sons, Borambola.	20	31	8	31	14	19	123

Septic Conditions of the Genital Organs of Cattle and their Relation to Sterility.

W. L. HINDMARSH, M.R.C.V.S., B.V.Sc., Senior Veterinary Research Officer.

DURING recent months, a number of specimens of the genital organs of cattle have been received at Glenfield Veterinary Research Station. These were forwarded with the request for information as to why the cattle did not breed. Examination showed that these organs were so affected by septic infection as to have rendered it impossible for the animals to have conceived again. The field veterinary officers of the Stock Branch have reported that such cases are by no means uncommon and that farmers frequently keep such cattle in their herds for long periods hoping that eventually they will breed again. Often the cattle are treated with various injections or instruments which in no way ameliorate the condition. Such cattle are only kept at an economic loss and should be fattened and sold to the butcher.

Sterility may be Due to Septic Infection.

In considering this question, it must be kept in mind that the membrane lining the genital organs is an extremely delicate structure. It is upon the membrane of the womb that the tiny fertilised egg which develops into the calf is implanted. Any inflammatory condition of this membrane will render it unsuitable for the implantation and growth of the embryo calf, with the result either that the embryo (foetus) fails to develop at all, that the foetus is aborted before development is complete, or that parturition is difficult and the membranes surrounding the calf are not readily expelled.

Most cases of infection of the womb and the other genital organs are generally considered to occur as a consequence of (*a*) prolonged and difficult calving, (*b*) retained afterbirth, (*c*) abortion, and (*d*) unskilled manipulation and interference with the genital organs. Whilst this is undoubtedly so in many cases, one must not overlook the fact that difficulty in calving, abortion, and retained afterbirth are often an indication that the genital organs were not normal prior to and during pregnancy. Infection may be in the womb prior to service and conception. Such infection may not necessarily lead to failure of the cow to become pregnant, but it may lead either to failure of the calf to develop until full time, or failure to expel the calf and its membranes normally. Rather than considering these happenings to be the cause of infection, one should frequently look upon them as the result of infection previously present.

Contagious Abortion and Sterility.

The common cause of abortion is infection of the cow with the organism of contagious abortion. This microbe usually enters the animal's body with the food, being picked up on the pastures with the grass—such grass having

been previously soiled by the discharges, membranes, calf or foetus of a previous abortion. After an abortion the genital organs are in such a state as to lead to their ready infection by other microbes and a septic condition of the breeding organs is set up. Unskilled interference with the organs and the injection of various disinfectants to remedy the condition frequently render the inflammatory condition much worse. It must be remembered that the discharge from such cases is highly infectious and farmers who try to treat the cattle and then handle other cows may spread the septic infection through their herd.

There is good reason for believing that in other cases the infection may be carried from cow to cow by the bull in service, and the presence of one infected cow in the herd may lead to the spread of disease from this animal to many others. There is no doubt whatever that, although the bull may not be a common carrier of abortion from cow to cow, he may spread many infections of the vagina and mouth of the womb by service.

Unskilled Treatment may Cause Sterility.

There is little doubt, however, that many cows which, owing to some slight inflammatory condition of the vagina and mouth of the womb, fail to breed after one or two services, are rendered permanently sterile by the treatment adopted by their owners. It has already been pointed out that the membrane lining the breeding organs is a delicate structure. Disregarding this fact or in ignorance of it, farmers frequently inject powerful antiseptic fluids, using instruments that are not by any means clean. Others, under the impression that the womb wants "opening up" force a piece of wood, a steel, or some special instrument into the mouth of that organ.

Regarding the first-mentioned treatment, strong antiseptic solutions should not be used at all. They cause severe inflammation and may render the cow incapable of breeding again. Any disinfectant used for flushing out the passage should be very weak and the treatment carried out with care.

The use of "tar sticks," and similar methods of smearing tar or other preparations on the inside of the vagina, are also condemned. Such treatment is useless, renders the condition more serious, and inflicts unnecessary pain.

Attempts to open the womb (by which is meant an attempt to force an opening through the neck of the womb) are usually not successful. The very nature of the passage in the neck of the womb renders it extremely difficult to open it when the cow is not pregnant. Whether successful or not, the use of pointed objects or even of a surgical instrument in the hands of an untrained man is barbarous and inflicts considerable pain on the animal. The inflammation so caused renders the cow liable to a severe and chronic inflammation of the part. Many cows which would have bred again under proper treatment have been made permanently sterile by the ill-judged enthusiasm of the owner or his friends in treatment.

The position, then, is as follows:—

(*a*) Many cattle are permanently sterile from septic infection.

(*b*) Such sterility may have originated from an attack of contagious abortion which opened the way for other infections.

(*c*) Infections setting up inflammatory conditions of the genitals may be spread by manual interference or by the bull.

(*d*) Unskilled treatment may cause sterility instead of curing it.

Diagnosis.

It is difficult for anyone not specially trained to determine whether a cow is likely to breed again after it has been to the bull two or three times without result. Where, however, there is a persistent discharge from the vagina and a careful examination of the passage by hand (after the hand and arm have been well scrubbed with disinfected water and smeared with vaseline) shows that the discharge is coming from the womb, it can be decided that such a cow is unlikely to respond to treatment by the farmer. Frequently, however, there is an accumulation of purulent material in the womb, the walls are chronically inflamed, and the mouth of the womb closed. Such a cow may look healthy but will not breed again, and yet the condition could only be determined by a skilled examination. She is often "on heat" and careful inspection should be made of all cows at this period. When, after treatment as described below, the cow still constantly returns to the bull, the farmers should decide that the animal is unprofitable and dispose of it to the butcher.

In other cases the cow may fail to exhibit heat. This is due to some diseased condition of the ovaries. Various methods of manipulation of the ovaries have been used by veterinarians in order to overcome the abnormal conditions. Such work, however, requires the services of a trained veterinary surgeon. One important point to be borne in mind is that diseases of the ovary are intimately associated with septic conditions of the womb, and if these latter are kept under control, it will be found that most cows will show heat at regular periods.

It should be borne in mind that the period from service to normal birth is about 280 days. (One author gives the normal period as 285 days.) Any marked deviation in this period is an indication that the sexual health of the animal is disturbed and, even though the calf is born alive, the cow is not normal. By keeping careful records of dates of service and of birth a farmer may form an opinion as to the sexual health of his cattle before any marked degree of sterility is noted.

Prevention and Treatment.

(*a*) All cows that abort should be isolated and kept apart from the remainder of the herd until all discharges cease. The discharges, afterbirth, and calf should be burned where they lie.

(*b*) Treatment of cows with discharges from the vagina should consist of very mild antiseptic douches daily—lysol or similar disinfectant 1 per cent., or permanganate of potash 0.5 per cent. is suitable. Plenty of

'The Starter.'

fluid should be used, but it should not be forced in. A funnel and rubber tubing provides a cheap and satisfactory method.

(*c*) Cows should not be served by the bull whilst the discharge persists.

(*d*) The sheath of the bull should be disinfected after he has served any cows that have suffered from disease of the genital organs, using a 0.5 per cent. solution of potassium permanganate.

(*e*) No instruments should be used to force a passage into the womb.

(*f*) Cows which show a persistent discharge after three or four weeks treatment should be disposed of.

Breeding Up a Clean Herd.

On an affected property the cattle should, if possible, be divided into two herds. These should not come in contact nor use the same pastures. In one herd would be placed all the young cattle intended for breeding, and in the other all the adult and infected cattle. A separate bull should be used for each herd. Gradually the number of cattle in the adult-infected herd would decrease, whilst that of the young, clean herd would increase until finally all the older cattle would be disposed of and the younger cattle, which had been protected from infection, would remain as a clean herd.

In making use of this method of securing a herd free from disease, care must be taken to prevent contact with other cattle, and especial care must be taken with all new purchases. Such cattle should be kept in isolation, preferably until after calving, before being permitted to mix with the clean herd.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1929.

West Wyalong	... Sept. 3, 4	Boorowa	... Sept. 26, 27
Corowa (H. G. Norton) ...	... ,, 3, 4	Ardlethan	... Oct. 2
Forbes (K. O. Anderson)	... ,, 3, 4	Quandialla	... ,, 2
Young (T. A Tester) ...	... ,, 4, 5	Walbundrie (H. G. Collins)	... ,, 2
Gosford (J. S. Gardiner)	... ,, 6, 7	Hay (G. McCracken) ...	... ,, 2, 3
Ganmain (C. C. Henderson)	... ,, 10, 11	Narrandera (J. D. Newth)	... ,, 8, 9
Cowra	... ,, 10, 11	Manildra (P. Rubie) ...	... ,, 8, 9
Albury (A. G. Young) ...	... ,, 10, 11, 12	Ariah Park	... ,, 9
Barmedman	... ,, 11	Bribbaree	... ,, 9
Canowindra	... ,, 17, 18	Griffith	... ,, 15, 16
Temora	... ,, 17, 18, 19	Carcoar	... ,, 16
Singleton (J. T. McMahon)	... ,, 18, 19, 20	Cootamundra (R. D. Beaver) ...	,, 22, 23
Murrumburrah	... ,, 24, 25	Deniliquin (D. Fagan) ...	... ,, 22, 23
Barellan	... ,, 25		

Infectious Diseases Reported in July.

The following outbreaks of the more important infectious diseases were reported during the month of July, 1929:—

Anthrax	2
Blackleg	6
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia contagiosa	8
Swine fever	Nil.
Contagious pneumonia	Nil.

—Max Henry, **Chief Veterinary Surgeon.**

Imports and Exports of Fruit.

The following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 30th June, 1929:—

Description.	Imports.	Exports.
Interstate.		
	Cases.	Cases.
Fresh Fruit ...	729,015	68,170
Tomatoes ...	76,007	...
	crates.	crates.
Melons	14	...
	lb.	lb.
Canned Fruit ..	10,640	1,988
Dried Fruits—		
Unspecified ...	9,380	504
Currants ..	3,640	280
Raisins ..	4,984	224
Apricots ...	224	...
Apples ...	588	..
Peaches ..	364	..
Prunes ...	616	56

Description.	Country of Origin.	Imports.	Exports.
Oversea.			
Fresh Fruits—		Centals.	Centals.
Apples ..	....	...	2,516
Bananas ...	....	7,390	...
Lemons ..	... .	...	268
Oranges ..	....	...	3,780
Grape Fruit ...	....	...	23
Pears	.. ..	...	1,853
Pineapples ...	....	...	344
Other	....	226	7,692
Dried Fruits—		lb.	lb.
Apples, Pears, Peaches &c....	South Africa ...	50	...
Apples ...	U.S.A.	1,000	5,015
Apricots ...	....	..	196,592
Currants	United Kingdom	392	78,140
Prunes ...	U.S.A	40,176	779
	France	168	...
Peaches ...	....	...	1,120
Raisins—			
Sultanas ...	Egypt	84	1,202,622
	U.S.A.	3,520	...
Lexias ...	....	...	84
Other ...	U.S.A.	3,600	2,046
Dates	France	1,013	5,480
	Mesopotamia ...	2,945	...
Other—	. ...	...	2,218
	Asia Minor ...	2,905	...
	China	4,133	...
	Italy	10	...
	United Kingdom	179	...
	U.S.A.	760	...
Preserved in liquid—			
Apricots ...	....	...	522,537
Peaches ...	....	...	893,919
Pears ..	....	...	7,480
Pineapples ...	....	...	146
Raspberries	....	...	16,970
Other ...	....	...	22,487

A New "List of Publications."

A twenty-four page leaflet containing the titles of all the Department's publications has recently been issued. You are invited to apply for copies of this useful list, a scrutiny of the pages of which will certainly reveal some publication on just the subject you have been in need of advice on.

Write at once for a copy.

The Banana Aphid

(*Pentalonia nigronervosa*, Coq.).

E. H. ZECK, Assistant Entomologist, and H. W. EASTWOOD, H.D.A., Fruit Instructor.

THE first published record of the presence of this aphid for New South Wales was that of infestation in the Tweed River district, made by W. W. Froggatt (3) in 1923, but the aphid had doubtless been there for some years previously.

Economic Importance.

When these aphids are present upon a banana plant they must be considered, not only from the point of view of the damage caused to the plant by their sucking up the sap, but also that they have proved to be carriers of the virus of "bunchy top." It has been definitely shown (5) that they are able to transmit bunchy top from a diseased plant to a healthy one. They are also known to transmit bunchy top of Manila hemp (*Musa textilis*) in the Philippine Islands (4).

Food Plants.

The known food plants of this aphid throughout the world are *Musa sapientium*, *Musa banksii* (bananas), *Musa textilis* (Manila hemp), *Musa* spp., *Alpinia rafflesiana*, *Alpinia speciosa*, *Arum maculatum*, *Strelitzia* sp., and *Ravenala* sp.

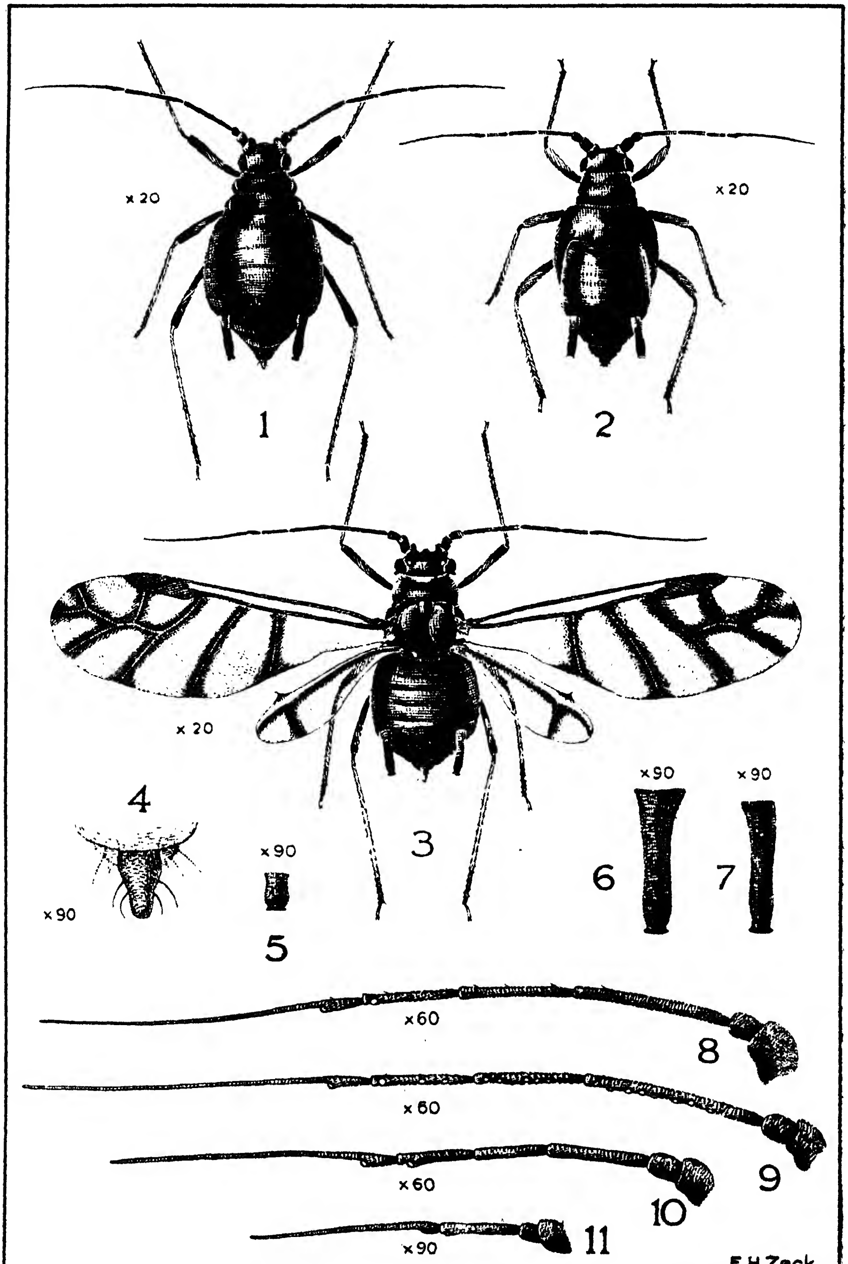
Description and Habits.

The viviparous forms are those which give birth to living young and do not deposits eggs. Egg-laying forms of this species are not known.

The adult viviparous aphids are of two forms, winged and wingless. They vary in colour from reddish to dark-brown, and in their immature stages are of a lighter hue. The fore wings have a very peculiar venation, unlike that of any other member of the family *Aphididae*, whilst the veins possess dusky to almost black borders, easily visible with the aid of a hand lens. The hind wings are very small. The length of the body of the adult measures a little more than one-twenty-fifth of an inch in length.

These aphids are to be found around the base of the pseudostem at soil level and for several inches below the surface, and also on young suckers just emerging from the ground. Dense colonies occur between the sheath of the outer leaf and pseudostem, and also along the under surface of the leaves about the mid-ribs.

No egg stage is known and no sexual males or females have ever been observed. This means, therefore, that all the mature individuals known, both winged and wingless, are females which parthenogenetically (*i.e.*, without the help of males) give birth to living young. These, in their turn, later reproduce in a similar manner, and thus generation follows



The Banana Aphid (*Pentalonia nigronervosa*, Coq.)

(1) Wingless viviparous female. (2) Nymph or developing winged form. (3) Winged viviparous female. (4) Cauda or tail of wingless viviparous female. (5) Cornicle of larva (1st instar). (6) Cornicle of wingless viviparous female. (7) Cornicle of winged viviparous female. (8) Left antenna of wingless viviparous female. (9) Left antenna of winged viviparous female. (10) Left antenna of nymphal form. (11) Left antenna of larva (1st instar).

generation throughout the year. The aphids increase in numbers with great rapidity, so that a few individuals upon a plant soon become surrounded by their progeny and in a little while a dense colony is formed. Although they flourish throughout the year, summer is their period of greatest abundance. Moist seasons also aid in their development. These aphids, in common with most others, excrete (from the anus) the characteristic "honey dew," a sweet solution attractive to ants. Where the aphids are numerous this honey dew is given off in such quantities that it accumulates around the pseudostem between the sheathing bases of the leaves, and in this sugary solution yeasts are found developing in sufficient numbers to form a white slimy paste (5).

Distribution.

For the information of growers the following records of their occurrence throughout the world are given below. This aphid was first described and figured from specimens found infesting bananas growing at St. Denis (Isle Bourbon) by the French entomologist Coquerel in 1859. Apparently nothing further was recorded until 1909 (2) when it was found very abundantly on banana plants in the greenhouses of the United States Department of Agriculture. It has since been recorded from various parts of the world, as follows:—Australia (Froggatt, 1923; Magee, 1927; Hardy, 1928); Bermuda (Ogilvie, 1925); Brazil (Moreira, 1925); England, Kew (Laing, 1922); Formosa (Takahashi, 1923); Hawaii (Fullaway, 1910; Zeck, 1926); Fiji (Magee, 1926); India, S. (Theobald, 1923; George, 1928); Jamaica (Gowdey, 1925); Philippine Islands (Ocfemia, 1927); Trinidad, Egypt (Laing).

Brief Technical Note.

Winged viviparous female.—Length of body, 1.2 to 1.6 mm.; wing expanse 5 mm.; antennae, 1.8 mm.; sensoria, variable in number, III with 5-12 (average 8), mostly on distal two-thirds; IV with 4-7 (average 6), spaced along length; V with 1-3 (average 2), usual distal, one; small cluster and base of spur on VI. The wing venation is peculiar in that the radial sector has extended downwards and fused with the upper branch of the media, and has then turned again towards its natural course near the tip of the wing.

Wingless viviparous female.—Length of body 1.2 to 1.6 mm.; antennae, 1.7 mm.; V with distal sensorium; VI with cluster at base of spur.

Nymph.—Length of body, 1.5 mm.; antennae, 1.4 mm.; V with distal sensorium; VI with cluster at base of spur.

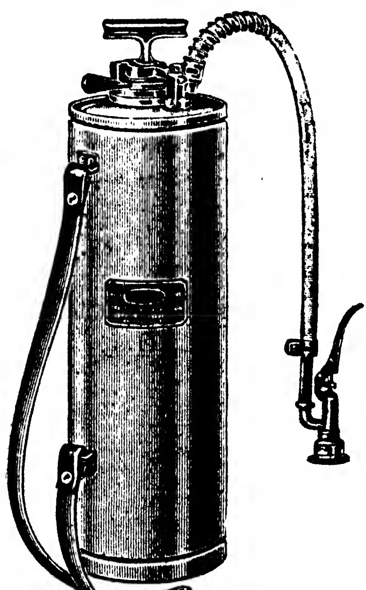
Larva (1st stage).—Length of body, 0.45 mm.; antennae, 0.45 mm.; four segmented; III with one sensorium at distal end; IV with one at base of spur.

The general body shape, together with the character of the cornicles, cauda, wings, &c., are given in the accompanying illustration.

General Control Measures for Banana Aphid.

For the control of aphids upon healthy plants, a tobacco wash solution, made at the strength of 25 lb. stalk or waste tobacco to 72 gallons of water, or else nicotine sulphate (40 per cent.), 1 pint to 75 gallons of water, is recommended. The addition of soap (3 lb. to 75 gallons) to the above sprays, to act as a "spreader," will ensure a much more even distribution.

All suckers, and even around the bases of the plants, should be sprayed, and where a heavy infestation has occurred it may be advisable to repeat the spraying to kill those aphids which may have been missed during the first application. When spraying, the pressure should be kept high and a fairly coarse nozzle used to ensure a drenching spray, as it is necessary to "hit" and wet the aphides to obtain a kill.



A Hand Compressed-air Pump.

General spraying of plantations situated on hilly country strewn with rock and boulders is considered impracticable when using power pumps or large barrel pumps, but some form of control should be undertaken, although the cost of treatment will be increased according to the inaccessibility or rough nature of the surface. Thus, where it is impracticable to use either a power or barrel pump, a bucket, knapsack, or a hand compressed-air pump somewhat of the type illustrated (which pumps to a pressure of 120 lb., holds 3 gallons of spray, and when in use is carried as a knapsack) could be used.

It is preferable to have the pump fitted with an automatic "cut-off" nozzle by which the stream of spray can be regulated from fine to coarse. In many instances also, especially when spraying well-grown plants, an extension rod of, say, 3 to 4 feet long, will facilitate the application of the spray, particularly when it is necessary to reach up and spray down into the centre of the plant. It is safer when spraying at the pressure mentioned to use a pump fitted with a gauge.

It is necessary that the spraying outfit used in a banana plantation should be of such a type that the spraying may be done with one hand, thus leaving the other hand free to be used in moving parts of the banana plant, as it is necessary to pull the leaves somewhat downwards to enable the spray to penetrate around the basis of the leaf-sheaths and pseudostem as well as to cover the leaves themselves.

Spraying should commence as soon as any aphids make their appearance in the spring and should continue throughout the summer and autumn, at

any rate on the plants showing infestation. Even if the aphids are not numerous and are not carriers of disease their increase should still be checked.

It is desirable to spray the plants when young, and until such time as they attain the bearing age, as it is during this stage in the development of a plantation that spraying is most essential, because if thoroughly carried out it practically insures the plantation for the first cut of fruit. After the plants have commenced to bunch it is a formidable task to spray the whole plantation thoroughly.

Destruction of Aphids Infesting "Bunchy Top" Plants.

In the banana-growing areas, where "bunchy-top" plants are to be destroyed, it is required to kill the aphids by spraying with a contact insecticide such as tobacco wash, nicotine sulphate, or kerosene, before destroying the plant. It is essential to adopt this procedure because many of the aphids may fly or crawl to surrounding healthy plants, carrying "bunchy top" disease with them. For these diseased plants, an excellent material for the destruction of both aphids and the plant is kerosene. Power kerosene is preferable to lamp or refined kerosene, as it is both cheaper and more efficacious.

A Suitable Type of Compressed-air Sprayer.
Showing method of applying the spray in a banana plantation.

The undiluted kerosene should be poured down the funnel leaf of the diseased plant, using $\frac{1}{8}$ pint for suckers, $\frac{1}{4}$ pint for half-grown plants and $\frac{1}{2}$ pint for large plants. As the kerosene permeates all the leaf axils and penetrates right into the base of the pseudostem it kills the aphids, and after a day or so the leaves will begin to fall apart and the whole plant die off to the ground level. Kerosene, however, has little or no action upon the infected corms of the plant, but under the present regulations the corms must be dug out of the ground.

The use of these limited quantities of kerosene has the advantage that but little bulk or weight of material needs to be carried as compared with

dilute tobacco or nicotine when used. Moreover, it is easily handled and may be kept in bottles or containers in different parts of the plantation, so that when an infected plant is seen it may be treated immediately.

Regulations under the Plant Diseases Act, 1924.

Quarantine Areas declared on account of the presence of Bunchy Top or Banana Borer.

26. (1) No person shall remove any plant or any part of a plant of the Genus Musa out of a quarantine area or from one plantation to another within a quarantine area unless a permit in or to the effect of Form 8 for the movement has first been issued by an inspector.

(2) Application for a permit shall be made in or to the effect of Form 9.

27. (1) No person shall plant any plant or any part of a plant of the Genus Musa on any land within a quarantine area unless a permit in or to the effect of Form 10 has first been issued by an inspector.

(2) Application for a permit shall be made in or to the effect of Form 11.

28. Every owner and every occupier of land within a quarantine area shall keep the ground surrounding any plant of the Genus Musa free of weeds for a distance of not less than two yards from the plant.

29. Every owner and every occupier of land within a quarantine area on which is any plant of the Genus Musa which is infected with bunchy top or in connection with which the provisions of Regulation 28 have not been complied with for a period of six months shall treat and thereafter destroy the plant in the manner prescribed by Regulation 30.

30. Any person who, in accordance with the provisions of Regulation 29 is required to treat and destroy any plant of the Genus Musa shall

(i) spray the whole surface of the plant with a contact insecticide in such a manner as to kill all aphis in the plant or shall pour down the centre of the stem of the plant not less than two liquid ounces of kerosene;

(ii) thereafter dig the plant out of the ground;

(iii) forthwith split each stem longitudinally; and

(iv) slice the corms into sections not exceeding one inch in thickness.

31. If the written permission of an inspector in or to the effect of Form 12 shall first have been obtained such person may in lieu of compliance with Regulation 30 keep continuously on the land cattle not being less in number than that specified from time to time by an inspector.

31A. In the immediately preceding six Regulations—

"Plant of the Genus Musa" includes bananas, plantains, and manila hemp;

"Quarantine area" means an area declared by the Minister to be a quarantine area on account of the presence or suspected presence of bunchy top or on account of the presence or suspected presence of banana borer (*Cosmopolites sordidus*).

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The Apple Leaf Jassid.

(*Typhlocyba australis*, Frogg.)

SOME OBSERVATIONS AND EXPERIMENTS AT BATHURST EXPERIMENT FARM.

N. S. NOBLE, B.Sc.Agr., Assistant Entomologist.

IN the course of investigations on the codling moth at Bathurst, New South Wales, during the 1928-29 season, it was possible to devote a certain amount of time to the study of the life-history of the apple leafhopper or jassid, and to carry out experiments for the control of this pest. As the time available for this work was necessarily limited, it was decided to concentrate on those phases of the insect's life-history and habits which would have a direct bearing on its control.

This insect was originally described by Froggatt[1] under the name of *Empoasca australis*, but was later referred to by Myers[2] as belonging to the genus *Typhlocyba*, and is now known as *Typhlocyba australis*.

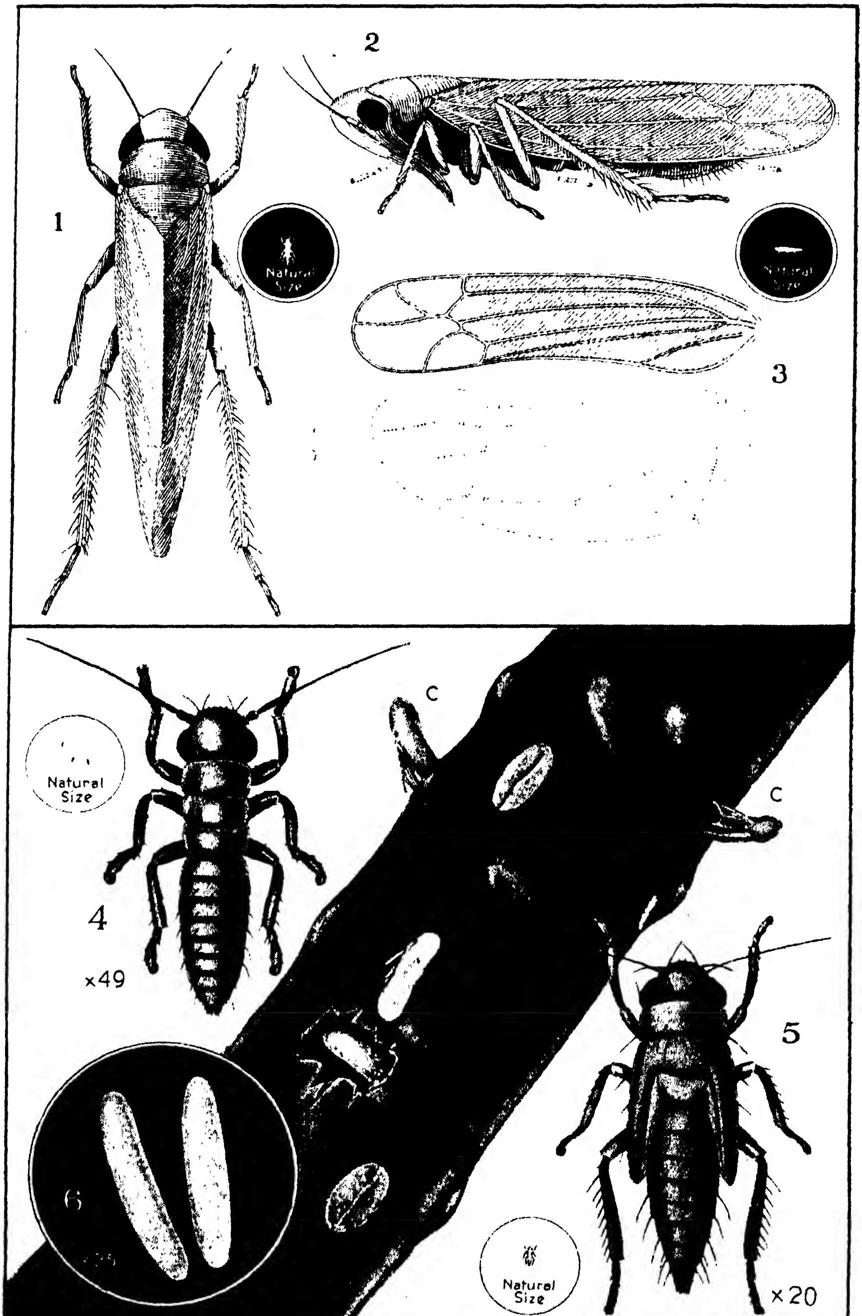
The insect was first recorded in literature as a pest in 1918, but Froggatt states that it was present in the southern districts of Yass and Binalong for some years prior to this. Since then the pest has spread steadily, and during the past few seasons has been very prevalent in the Penrose, Binalong, Batlow, and Bathurst districts, and has recently been reported from the Tenterfield, Yetholme, and Rydal districts. Apart from Australia it is, at present, only known to occur in the north and south islands of New Zealand.

The adult leafhopper, as will be seen from the accompanying illustration, resembles a miniature cicada in general form. It is approximately one-sixth of an inch in length, of a general greenish-yellow colour with conspicuous reddish-brown eyes, and with legs well adapted for jumping.

The insect is slender in form, tapering towards the end of the body, which is covered with two pairs of wings, fitting closely together in a roof-like manner over the body. In its immature stages the insect is smaller in size and paler in colour than the adult, but resembles the latter in general form, with the further exception that the wings are not fully developed. A technical description of the insect appears in the *Proceedings of the Linnean Society of N.S.W.*, vol. xlvi, 1921.

Nature of Injury.

The damage to the foliage is caused by the insect, in all stages of its development, extracting the sap from the leaf, thereby causing it to become a mottled grey colour. As the number of hoppers increase the damage becomes more pronounced, and the leaves become quite yellow and may fall prematurely.



The Apple Leaf Jassid (*Typhlocyba australis*, Frogg.).
(1) Dorsal view. (2) Side view. (3) Wings. (4) First stage nymph. (5) Last stage nymph. (6) Eggs. (7) Twig showing (A) lenticel, (B) egg in situ, (C) nymph emerging, (D) egg swelling.

Seedlings which were infested with large numbers of the pest early in the season, lost all their leaves and became greatly distorted and unhealthy before the close of the season. This indicates that where heavy infestation of nursery stock appears, serious damage will result if the infestation remains unchecked.

The more serious damage in the orchard, however, is due to the fact that the insects settle on the fruit and deposit an unsightly brown excrement which, unless removed, either reduces the market value of the fruit or renders it totally unsaleable. This deposit is difficult to remove and is more noticeable on the light-skinned varieties. The adults live for considerable periods, and as they feed freely they probably cause more damage than the nymphs.

Host Plants.

The apple was found to be the only tree in which the jassid deposited its eggs and was the only kind of fruit-tree on which any extensive damage was visible. Winged adults only were frequently noticed on pear-trees adjacent to apples, but had caused no apparent injury. Nymphs and adults removed from apple-trees, however, fed freely and developed normally on pear twigs in the insectarium.

Late in the season considerable numbers of adult jassids were found on prune-trees adjacent to apples and had actually caused slight mottling of the foliage. They also fed quite freely on prune twigs in the insectarium when transferred from apple foliage. Nymphs and adults removed from apple foliage fed freely and developed on foliage of a climbing rose in the insectarium.

Experimental Procedure.

Data on the life-history of this insect as set out below have been compiled as a result of field observations combined with studies made in the insectarium throughout the season. The insectarium used for these studies was the same as that used for codling moth investigations and consisted of a wooden framework covered with wire gauze. Two methods were devised for the study of the pest in the insectarium, viz., (1) the seedling method, and (2) the twig-jar method.

(1) *Seedling method.*—This consisted of the use of apple-trees one year old placed in pots and cut back to provide new growth. These were enclosed in special gauze cages to prevent the hoppers from escaping and yet permit of easy observation. Several breeding cages, each fitted with a glass side, were also utilised, it being possible to make direct observations on the insects on the seedlings without disturbing them.

The seedlings were placed on the ground in the insectarium in such a position that the conditions under which they were growing approximated very closely those of the field. These seedlings were artifically infested throughout the season, and by this means it was possible to isolate the various broods and so ascertain their number and extent.

Apple Foliage and Fruit Infested with Jassids.

(2) *Twig-jar Method.*—This consisted of the placing of apple twigs in water in glass tubes placed in two-quart mason jars covered with butter muslin. When necessary the twigs were replaced with fresh ones. Freshly hatched nymphs and freshly emerged adults were transferred to these twigs and thereafter daily inspections were carried out to ascertain the time required for the nymphs to reach the adult stage and also the length of life of the adults of the various broods. A large number of jars were used and thus it was possible to obtain more complete data, and supplement the observations obtained from the seedling method.

Owing to the delicate nature of the young hoppers their transference to the jars, after hatching, was effected with the aid of a camel hair brush.

LIFE-HISTORY AND HABITS.

The First Generation.

The Overwintering Eggs.—The first brood jassids hatch in the spring from eggs laid during the previous autumn in the fleshy tissues of the upper layers of the bark. These eggs, which are approximately one-fortieth of an inch in length, are elongate with rounded ends and are a general translucent white colour. They are deposited singly in a position more or less transverse to the length of the stem, the position of the egg being marked by a small elongate swelling approximately one twenty-fifth of an inch in length, though in some cases, particularly on older limbs, no swellings whatever are visible. In other cases the eggs have been deposited in minute crevices at the sides of the lenticels. The eggs are deposited most extensively in bark of wood which has developed during the season, but numerous eggs are laid in the bark of one- and two-year-old wood, and nymphs were observed emerging in fairly extensive numbers from beneath bark and limbs as much as five years old.

The removal of a large part of the current season's growth during the normal pruning operations will result in the destruction of very large numbers of eggs.

How the Nymphs emerge.—The nymph appears head foremost from beneath the bark and within five minutes its entire length becomes visible as an elongate translucent white cylindrical body, sloping away to a rounded point at its posterior end and standing out freely from the surface of the twig. The legs and antennae are at first invisible, being closely apposed to the surface of the body. In a period ranging from eight to ten minutes after its first appearance the abdominal segments become visible, the legs are freed and slowly drawn up into their normal position, and the fine filiform antennae become separated. A few minutes later the nymph places its legs, which have been hanging freely, on to the surface of the twig, and finally succeeds in freeing itself, the whole process of emergence having occupied a period of from eighteen to twenty-five minutes. In some cases observed, the nymphs failed to free themselves and died with the head and portion of the thorax protruding from the twigs, while others,

after emerging, remained with the tip of the abdomen attached to the emergence hole and died in that position.

Immediately after emergence of the nymph the swelling becomes less noticeable, but the egg swellings from which nymphs emerged in previous seasons are marked by small, irregular elevations in the bark of the older wood. The freshly emerged nymph measures approximately one-fortieth of an inch in length and is translucent white, apart from the two prominent dark eyes. The head and thorax are very prominent compared with the abdomen, which is very narrow and consists of conspicuously rounded segments.

The nymph is very active and usually crawls directly on to the end of the twig and takes up a position on the under-surface of a young developing leaf at the tip. When they emerge from the bark on older wood the nymphs may crawl along the main twigs and branches for some time before finally settling beneath the leaves.

Emergence of the First Brood Nymphs.—The season was an abnormal one, the spur burst and blossoming of the trees occurring approximately three weeks earlier than usual. The first nymphs were seen emerging on 16th September, from a "Wealthy" apple. At this time the tree was not yet in full leaf, most of the flowers being in the advanced pinking stage, while a few only had opened. Thus, though the first hatchings of jassids occurred probably a few weeks earlier than they would normally, there would appear to be a definite relation between the first emergence and the spur burst and blossoming of the trees, the young jassids emerging some days after the spurs burst and the young leaves appear. The orchardist should examine his trees carefully at this time, and the advanced hatchings of the insect can be readily observed.

Where varieties have a later spur burst there would appear to be a corresponding delay in the first hatching of the nymphal jassids on these trees. Thus no hatchings were recorded until more than a week later on Rome Beauty apples than on the earlier varieties where the spur burst and blossoming had been more advanced.

The first brood nymphs continued to emerge from 16th September to 8th November—a period of fifty-four days. From field observations it was evident that the maximum emergence occurred during the early part of October, the emergence at the beginning and the end of the period being somewhat irregular and by no means extensive.

Nymphal Period of First Brood.—A series of first brood nymphs which hatched on 18th September, 26th September, and 3rd November were transferred to the insectarium, and thereafter inspected daily until maturity. It was found that though the earlier hatching nymphs required forty-one days to reach the adult stage, nymphs emerging on 3rd November, when the temperature had increased, reached the winged stage in periods varying from twenty-three to twenty-six days. The average length of the nymphal stage of forty-four individuals of the first brood was 33.66 days, the minimum period being twenty-three days and the maximum forty-one days.

Emergence of First Brood Adults.—The first adult of the first brood emerged in the insectarium on 17th October, but no adults were seen in the field until 24th October, on Five Crown, and 4th November, on Rome Beauty apples. The last adult emerged on 8th December, so that adults were emerging for a period of fifty-two days. Adults of the first brood began emerging twenty-two days before the last emergence of first brood nymphs, all stages of the insect thus being present on the tree for a considerable period. The number of adults present on the trees reached a maximum at the end of October and the first half of November, the numbers from then on showing a steady decline to the end of December.

Longevity of First Brood Adults.—The length of life of 130 adults of the first brood which emerged from 23rd October to 27th November was ascertained in the insectarium by means of the twig-jar method. The average length of life was 20.09 days, with a minimum of one day and a maximum of fifty-one days.

The Second Generation.

Eggs of the Second Brood.—The eggs of the second brood are, without exception, deposited by females of the first brood in the petioles, midribs, and main veins of the leaves, the majority being deposited in the midribs, and in this respect differs from the overwintering eggs, which are all laid in the bark of twigs and branches.

Emergence of Second Brood Nymphs.—Detailed records of the emergence of 1,065 second brood nymphs were obtained in the insectarium. The first nymph emerged on 30th November and the last on 17th February, the maximum emergence occurring during the middle of January. There was a total emergence period of eighty days.

Nymphal Period of Second Brood.—The average nymphal period of eighty-eight individuals was 21.60 days, *i.e.*, an average of twelve days less than the nymphal period of the first brood. The minimum was eighteen days and the maximum twenty-seven days.

Emergence of Second Brood Adults.—The first adult of the second brood emerged on 22nd December, and the last emergence took place on 9th March. There was an emergence period of seventy-eight days. The numbers of adults present on the trees steadily increased from the beginning of January, and very large numbers of winged forms were present on the trees from the end of January to the first week in March, when they were most numerous, but from then on the numbers steadily declined.

Longevity of Second Brood Adults.—The average length of life of sixty-one adults was found to be 18.61 days, with a minimum of five days and a maximum of forty-two days. The second brood considerably outnumbered the first brood. The emergence of the former, however, was more even over the whole period during which the nymphs and adults were emerging, whereas in the latter there appeared to be a definite peak period about the first week of October.

The Third Generation.

Five seedlings were infested with 300 second brood adults from 24th December to 26th February, but only thirteen nymphs of the third brood hatched. A third brood, therefore, does occur, but in view of the very small number of nymphs hatching from the seedlings infested with the 300 adults, it would appear that the numbers hatching from third brood eggs are very limited, and that the eggs largely overwinter. Further work is necessary on the development of the third brood. The first nymph of the third brood hatched on 29th January, *i.e.*, nineteen days before the emergence of the last nymph of the second brood, so that it would be impossible to distinguish the second and third brood in the field. The first adult of the third brood emerged on 21st February.

Nymphs of the third brood were observed to hatch up to 26th March, when daily observations ceased, but an inspection in the field on 7th June revealed both adults and well-developed nymphs in very limited numbers.

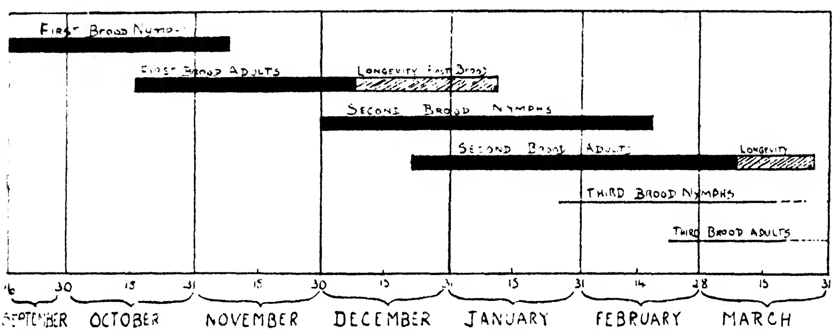


Diagram Showing Seasonal Occurrence of the Apple Leaf Jassid.

The accompanying diagram is included, which indicates the emergence periods of the various stages and broods throughout the season. As the last adult of the first brood died in the insectarium on 11th January and the last adult of the second brood died on 26th March, it is evident that for considerable portions of the season various stages of several broods will be present on the trees at the same time.

Both nymphs and adults normally shelter on the undersides of the leaves, and though occasionally seen on the upper leaf surface they very soon move back on to the lower side. It was noted also that by far the largest number of jassids were present on the leaves on the lower half of the tree, particularly on short spurs in the vicinity of the main limbs and crown. Large numbers congregate beneath a single leaf, between thirty and forty commonly being counted. When disturbed the adult hops and flies readily, but its flight is not sustained, consisting of a short sharp flight outwards from the tree followed by a rapid return.

The insect will eventually spread through an orchard for considerable distances, but the method of spread is apparently a slow one from tree to tree.

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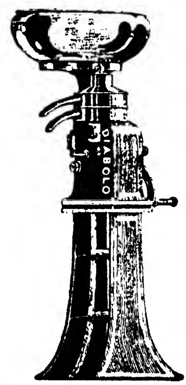

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Control Experiments.

The following contact sprays at the strengths indicated were tested:—

(1) Nicotine sulphate (40 per cent.), one part in 800 parts of water, plus hard soap at the rate of 1 lb. to 50 gallons.

(2) Miscible white oil, one part in forty parts of water.

(3) Red oil, one part in forty parts of water.

(4) Lime-sulphur, one part in thirty-five, combined with nicotine sulphate one part in 800 parts of water.

(5) Check—untreated.

Plots of sixteen trees were selected for each test, eight being Cleopatra and eight Five Crown apples, each plot consisting of four rows each containing four trees. The spray was applied with the aid of a power pump, using rods fitted with angle nozzles. Approximately 4 gallons of spray were applied to each tree, a pressure of 175 lb. per square inch was maintained, the spray being applied in the form of a mist, and care being taken so that the spray reached the undersurface of the leaves, where the young leaf-hoppers were feeding. Owing to the protected position in which the eggs are laid, and the fact that the adults fly readily when disturbed, the best control can only be expected by applying the spray when the majority of the jassids are in the wingless nymphal stages.

Two applications were given, the first on 4th October, when the most advanced nymphs were not more than half-grown, and the second application on 8th January. Inspection of the trees after the first application showed that a satisfactory control had resulted from all four sprays. No living jassids were found on the plots sprayed with nicotine sulphate alone or combined with lime-sulphur, but a few individuals were found on plots treated with miscible white oil and red oil, the kill apparently not being quite as satisfactory. It was noted, too, that the red oil had caused some burning of the foliage. A further inspection of the trees before the second application showed a number of immature jassids of the first brood to be present. These had emerged from overwintering eggs which had not hatched at the time of the first application and were uninjured by the spray. These matured and gave rise to a second brood of jassids, which, though limited, were in sufficient numbers to cause appreciable injury and necessitate the second application.

The results of the second application, in which all the previous treatments were again tested, were also satisfactory insofar as the kill of the jassids on the trees were concerned at the time of the application. The red oil again caused burning of the fruit and foliage, and resulted in partial defoliation of the trees, their drought-stricken condition probably aggravating this injury.

Subsequent to the second application further hatchings of second brood jassids continued evenly from 8th January until 17th February, *i.e.*, for a period of forty days. This even hatching, combined with a much reduced nymphal period, limits the value of a single spray application to kill the second brood, as at least two more applications would be necessary to secure

a satisfactory control. As the foliage at the time of emergence of the second brood is much more extensive and luxuriant than it was when spraying was carried out for the control of the first brood, a large quantity of spray would be required, and the density of the foliage would render it much more difficult to secure a satisfactory kill.

To secure the most satisfactory control at a minimum cost and to obviate the necessity for sprays to kill the second brood, two sprays instead of one to more completely control the first brood of nymphal jassids are recommended. The first application should be given just before the first nymphs reach the winged stage, and the second should be made from three to four weeks later. These two sprayings can be conveniently and more economically combined with the calyx spray and the first cover spray of lead-arsenate for codling moth control. If the period between the two sprayings is delayed beyond three or four weeks, the control of the apple jassid will be less satisfactory.

It is important to spray all parts of the fruit and foliage thoroughly, paying particular attention to the undersides of the leaves where it is known that the young nymphs are sheltering. In this respect, rods fitted with angle nozzles prove more effective than the pistol in directing the spray to the underside of the leaves, particularly on the foliage in the vicinity of the crown of the tree, where the larger number of jassids appear to shelter and feed.

The writer is indebted to the Senior Assistant Entomologist (Mr. T. McCarthy) for suggestions during the course of the work and for assistance in the preparation of this article.

Summary.

The Australian apple leaf jassid (*Typhlocyba australis*) first caused noticeable damage in 1918. Damage has been reported from all the chief apple-growing centres, but only to a limited extent in the northern parts of the State.

All stages of the insect feed on the undersides of the leaves. The damage is caused by the extraction of the cell sap, which produces a mottled yellow condition of the foliage. In addition, the deposition of excrement on the fruit reduces or destroys its value.

Two extensive broods and a very limited third brood occurred during the season.

Overwintering eggs are deposited in the autumn in the upper bark layers, the position of the egg being marked by a small elongate swelling about one twenty-fifth of an inch in length and running more or less transversely to the length of the stem.

The first brood nymphs commenced emerging on 16th September and continued to emerge until 8th November. The average first brood nymphal period was 33.66 days, with a minimum of twenty-three days and a maximum of forty-one days. First brood adults emerged from 17th October to 8th December. The average length of life of first brood adults in the insectarium was 20.09 days, but several individuals lived fifty-one days.

Eggs of the second brood are deposited by first brood females in the midribs, petioles, and main veins of the leaves. Second brood nymphs emerged from 30th November to 17th February, a period of eighty days. The second brood nymphal period was 21.60 days, the minimum being eighteen days and the maximum twenty-seven days. Second brood adults emerged from 22nd December to 9th March.

First and second brood adults, as well as second brood nymphs, were all present on the trees in the latter part of December and early January.

The average length of life of second brood adults in the insectarium was 18.61 days, with a minimum of five days and a maximum of forty-two days.

A third brood occurs but is extremely reduced. The majority of the third brood eggs overwinter. The first third brood nymph hatched on 29th January, the first third brood adult emerging on 21st February. It is impossible to distinguish the second and third brood in the field.

Control.—Nicotine sulphate (one part in 800 parts) plus hard soap 1 lb. to 50 gallons of spray, and nicotine sulphate (one part in 800 parts) combined with lime-sulphur (one part in thirty-five parts) proved the safest and most effective sprays. Both white and red miscible oils also gave reasonable control, but the red oil caused some injury to the trees.

The most effective control can be obtained by spraying the underside of the leaves before the first brood jassid reaches its adult stage. Two sprayings are necessary to secure satisfactory control. The first to be applied before the first nymphs reach the adult stage and the second from three to four weeks later. These sprays can be conveniently combined with the calyx spray and first cover spray of lead arsenate for codling moth control.

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Veterinary Research Report.

A correspondent writes: "I have received a copy of Veterinary Research Report No. 4 [Science Bulletin No. 33, issued by the Department of Agriculture], which is of immense value. As I have given this copy away to a friend, I would be glad if you would kindly send me another copy. I consider that these science studies of your Veterinary Research Station are of great value to the graziers of New South Wales."

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Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney, not later than the 12th of the month.

Maize—

Fitzroy ...	Manager, Experiment Farm, Grafton.
Leaming ...	Manager, Experiment Farm, Grafton.
Wellingrove...	Manager, Experiment Farm, Glen Innes.

Sorghum—

Collier ...	Under Secretary, Dept. of Agriculture, Box 36A, G.P.O., Sydney.
Feterita ...	Manager, Experiment Farm, Coonamble.
Gooseneck ...	Under Secretary, Dept. of Agriculture, Box 36A, G.P.O., Sydney.
Saccaline ...	Under Secretary, Dept. of Agriculture, Box 36A, G.P.O., Sydney,
	Mr. A. S. Pankhurst, William Street, Singleton.
Sumac ...	Manager, Experiment Farm, Bathurst.
	Under Secretary, Dept. of Agriculture, Box 36A, G.P.O., Sydney.
White African	Under Secretary, Dept. of Agriculture, Box 36A, G.P.O., Sydney.
	Principal, Hawkesbury Agricultural College, Richmond.

Millet—

Japanese ...	Manager, Experiment Farm, Coonamble.

Broom Millet—

Manager, Experiment Farm, Coonamble.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Topepo or Pepeto—the So-called Pepper Tomato.

Some enterprising local seedsmen are featuring in their seed catalogues the topepo or pepeto (the so-called pepper tomato). This fruit, which comes from America and is listed by some seedsmen in that country, is described as a cross between a tomato and a capsicum (pepper). It is very doubtful whether such a cross is possible, but the variety has been under trial during the past season at Grafton and other Experiment Farms, and the conclusion has been reached that it has no characteristics or qualities of the tomato. It is merely a large, mild, hollow, somewhat insipid pepper (capsicum), which is so late in maturing that it has taken a full eight months to mature at Grafton.—W. H. Darragh, Assistant Plant Breeder.

The Sulphuring of Apricots.

Recommendations of Committee Convened by the Council for Scientific and Industrial Research.

Earlier in the year a committee consisting of Messrs. Geo. Quinn, Chief Horticultural Officer, South Australia; C. G. Savage, Director of Fruit Culture, New South Wales; A. V. Lyon, Officer in Charge, Research Station, Merbein; and W. R. Jewell, Research Chemist, Department of Agriculture, Victoria, was convened by the Council for Scientific and Industrial Research to consider the question of sulphuring of dried fruits.

While the Committee considered that existing information was insufficient on which to base absolutely conclusive recommendations regarding procedure for the coming season in connection with all kinds of dried fruits, it was satisfied that there was quite sufficient data available to enable recommendations to be made, which, in the case of apricots, might reasonably be expected to give a satisfactory product in most instances. The sulphuring of pears and peaches, in the opinion of the Committee, did not offer any serious difficulties.

The Committee's recommendation in regard to apricots are reprinted below, and Mr. Savage, Director of Fruit Culture in this State, and a member of the Committee, is confident that if growers follow out these recommendations they will experience little difficulty in keeping the sulphur content below 14 grains per pound.

The Recommendations.

(*a*) *Maturity.*—It is essential that all fruit be picked "eating ripe" and that, when cutting, all firm or overripe fruit should be put to one side and either discarded or suphured separately, so that all the fruit in one chamber may be of uniform maturity, and, therefore, yield a uniformly sulphured product. It is recognised that firm fruit absorbs sulphur less readily than ripe.

(*b*) *Type of Chamber.*—It is recommended that an air-tight chamber be used; the covering of which should be of some light material, *e.g.*, "malthoid." In the case of movable hoods, every precaution should be taken to prevent ingress of air at the base of the hood, as, for example, by using compacted moist earth around the bottom.

A number of small air-tight chambers are recommended in preference to one large one, so that fruit shall not be held for any length of time after cutting and before sulphuring. For example, when using 6 feet x 3 feet trays the size of the chamber should be sufficient to accommodate a stack

of about fifteen trays, with a clearance of about 6 inches between the trays and the sides and top of the chamber. Trays should be staggered 6 inches when stacking.

Two controllable vent holes, 1 inch diameter and about 1 foot apart, should be provided in the roof of the chamber close to the wall farthest from the sulphur fire when one fire is used, or in the centre of the roof where a fire is used at each end of the chamber.

A movable vent-glass is a desirable adjunct in order to view the conditions inside the chamber and to test the condition of samples of the fruit.

(*c*) *Quantity of Sulphur.*—Seven to eight pounds of sulphur per ton of fresh cut fruit should prove ample, and it is essential that the sulphur be dry in order to burn readily. The sulphur pit should preferably be located just outside at one, or both, ends of the chamber, with a free entrance into the chamber, and adequate provision for closing the air inlet after the vents are blocked. Use a minimum amount of inflammable material to light the sulphur, and when fumes are issuing freely from the vents close the latter with tightly-fitting corks.

The weight of fruit in a charge should be calculated by weighing the quantity of pitted fruit on two or three trays, thus obtaining the average per tray and the total weight per charge. Calculate the amount of sulphur necessary, weigh this, and measure the volume in a container. Thereafter it would be sufficiently accurate to measure the same volume of sulphur each time a similar number of trays are sulphured.

(*d*) *State of Fruit.*—It is desirable to sulphur as quickly as possible after cutting, preferably within two hours. (Hence the desirability, under (*b*), of a number of small chambers.)

Fruit should be stacked from the bottom upwards in the order in which it is cut. Freshly-cut fruit absorbs sulphur dioxide more readily than that cut some time prior to sulphuring, and this arrangement of stacking allows the driest fruit to be in contact with the maximum density of warm sulphur fumes, thus tending to uniform sulphuring results.

(*e*) *Period of Exposure.*—Under average summer day temperatures four to six hours exposure to the sulphur fumes is considered sufficient to preserve the colour without over-sulphuring. The practice of leaving the fruit in the sulphur chamber overnight is not advocated as it frequently results in over-sulphuring. If it is found essential to sulphur overnight the vent holes should be opened at the end of three hours.

(*f*) *Characteristics of Sulphured Fruit.*—The filling of the cups with juice is not necessarily a reliable indication of satisfactory sulphuring, as fruit in this condition may frequently be over-sulphured.

Correctly sulphured fruit is usually characterised by a firm core, an easily detachable skin, with some uxudation of juice into the cup, and a general evenness of colour of the cut surface. The fruit is usually over-sulphured if the whole of the flesh has become softened, and if the cups have overflowed with juice.

Orchard Notes.

SEPTEMBER.

C. G. SAVAGE and W. LE GAY BRERETON.

Cultivation.

IN many of our inland and tableland districts a dry summer has been followed by an extremely dry winter. The absence of good soaking rains to wet the subsoil thoroughly to a good depth, makes it very necessary that useful falls occur during the spring, otherwise fruit-growers will be in an unenviable position, particularly in cases where water is not available for irrigation. Under these circumstances extra care should be taken not only to check waste of any soil moisture present, but also to have the soil in the best condition to absorb and retain any rain that falls. Hence a surface that is too fine should be avoided.

Where there has been practically no weed growth since the autumn or winter ploughing, and where the ground has not become compacted through trampling during pruning, spraying, or other operations, it is advantageous to delay the spring ploughing until after the spring spraying programme is completed, but if the soil has become compacted then it would be wise to plough at once. In this connection it should be remembered that the plough leaves the soil in a better condition to absorb the rain than does the cultivator

Pests and Diseases.

Codling Moth.—If not already done, a rigorous clean-up of the carry-over grubs should be completed before there is any chance of the moths emerging.

All pome fruit trees should be thoroughly searched, loose bark removed, holes and cracks examined, and any larvae (grubs) that are sheltering destroyed. All boxes or receptacles that contained fruit the previous season should be submerged in boiling water for not less than three minutes. Packing sheds, if at all possible, should be made moth-proof, and when the moths start to emerge from the cocoons it will be found that they collect on the window panes, thus making it an easy matter to destroy them, which should be done daily.

Green Peach Aphis, and Black Cherry Aphis.—In places where the oil spray (one part to twenty parts of water), applied when the buds are swelling, has failed to control these pests, a trial should be made of the spray that gave such good results in the experiments for the control of green peach aphis carried out by the Entomological Branch last season on the Murrumbidgee Irrigation Area. This spray consists of nicotine sulphate (40 per cent., diluted 1 to 600 parts of water by volume) to which soap is added at the rate of 1 lb. to every 25 gallons of spray. This spray is applied when the buds are well swollen or when the blossom buds are showing colour.

Black Peach Aphis.—A close watch should be kept for the black peach aphis, and as soon as it appears spray thoroughly with nicotine sulphate (1 to 800 parts of water by volume), or with tobacco wash. If within two

days of spraying any live aphids remain, the trees should be sprayed again. The application should be made by holding the nozzle close to all affected parts in order to break up the clusters of aphids.

Leaflets on black peach aphis and on the making of tobacco wash are obtainable on application from the Department.

Black Spot of Apple and Pear.—In districts where apple and pear trees are liable to black spot infection, they should be sprayed with either Bordeaux mixture or lime-sulphur when the buds show a green tip, or at an early spur-burst stage.

Leaflets on black spot of apple and pear, and on black spot, oidium, and downy mildew of the grape are obtainable free of charge on application to the Department.

Tubercle-free Herds.

Of the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number tested.	Expiry date of this Certification.
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys) ...	42	9 Aug., 1929
P. F. Mooney, Calala ...	33	16 ,, 1929
Kyong School, Moss Vale ...	2	21 ,, 1929
Department of Education, Mittagong Farm Homes ...	34	23 ,, 1929
Blessed Chanel's Seminary, Mittagong ...	4	25 ,, 1929
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys) ...	75	25 ,, 1929
Presbyterian Ladies College, Goulburn ...	4	26 ,, 1929
Walaroi College, Orange ...	5	30 ,, 1929
Riverstone Meat Co., Riverstone Meat Works, Riverstone ...	121	5 Sept., 1929
J. L. W. Barton, Wallerawang ...	22	11 Oct., 1929
W. McLean, Unanderra ...	44	1 Dec., 1929
Department of Education, Brush Farm, Eastwood ...	8	5 ,, 1929
Lunacy Department, Morisset Mental Hospital ...	21	7 ,, 1929
J. Davies, Puen Buen, Scone (Jerseys) ...	30	12 ,, 1929
Kinross Bros., Minnamurra, Inverell (Guernseys) ...	73	14 ,, 1929
Lunacy Department, Callan Park Mental Hospital ...	22	19 ,, 1929
Miss Brennan, Arrankamp, Bowral ...	14	20 ,, 1929
E. S. Cameron, Big Plain, Narrandera ...	39	10 Jan., 1930
Lunacy Department, Rydalmere Mental Hospital ...	68	11 ,, 1930
G. A. Parrish, Jerseyland, Berry... ...	77	12 ,, 1930
New England Girls' Grammar School, Armidale ...	28	16 ,, 1930
G. Miller, Casula ...	15	1 Feb., 1930
Queanbeyan Municipality (various owners) ...	41	1 ,, 1930
St. Joseph's Convent, Reynold-street, Goulburn ...	5	19 ,, 1930
St. John's Boys' Orphanage, Goulburn ...	9	19 ,, 1930
St. Michael's Novitiate, Goulburn ...	5	20 ,, 1930
Department of Education, Yanco Agricultural High School ...	32	23 ,, 1930
Lunacy Department, Kenmore Mental Hospital ...	81	28 ,, 1930
St. Joseph's Girls' Orphanage, Kenmore ...	9	1 Mar., 1930
Tudor House School, Moss Vale ...	8	6 ,, 1930
Department of Education, Hurlstone Agricultural High School ...	42	10 April, 1930
Navua Ltd., Grose Wold, via Richmond (Jerseys) ...	10	11 ,, 1930
Australian Missionary College, Cooranbong ...	43	17 ,, 1930
Department of Education, Gosford Farm Homes ...	37	24 May 1930
William Thompson Masonic School, Baulkham Hills ...	27	24 ,, 1930
F. W. Hopley, Leeton ...	29	29 ,, 1930
J. F. Chaffey, Glen Innes (Ayrshires) ...	54	29 ,, 1930
P. Ubrihien, Corridgeree, Bega ...	119	8 June, 1930
E. P. Perry, Nundorah, Parkville (Guernseys) ...	23	14 ,, 1930
Sacred Heart Convent, Bowral ...	11	17 July, 1930
Marion Hill Convent of Mercy, Goulburn ...	19	19 ,, 1930
A. Shaw, Barrington (Milking Shorthorns) ...	104	2 Aug., 1930
St. Patrick's College, Goulburn ...	9	7 ,, 1930

—Max Henry, Chief Veterinary Surgeon.

Poultry Notes.

SEPTEMBER.

E. HADLINGTON, Poultry Expert.

THE first week in this month should see the last incubators for the season filled so that all chickens are out by the end of the month. The continuation of hatching much beyond that time generally results in badly grown young stock, which are usually a couple of months later coming on to lay than those hatched earlier. The main reason for this is that when the chickens are about half grown they meet with the most trying part of the summer, and development is practically at a standstill until the advent of cooler weather. Another factor is that the rearing accommodation is often congested at the end of the season and the pens are becoming "stale" because of continuous use.

It may be argued, on the experience of a season or two, that chickens can be hatched later than September with satisfactory results, and while this is, in a measure, true where they are reared on fresh ground or under particularly favourable conditions, the practice is not sound for the commercial poultry-farmer. Those who have had the experience of late hatching under ordinary conditions, and have met with the troubles usually associated therewith, will not be likely to prolong the season so late again.

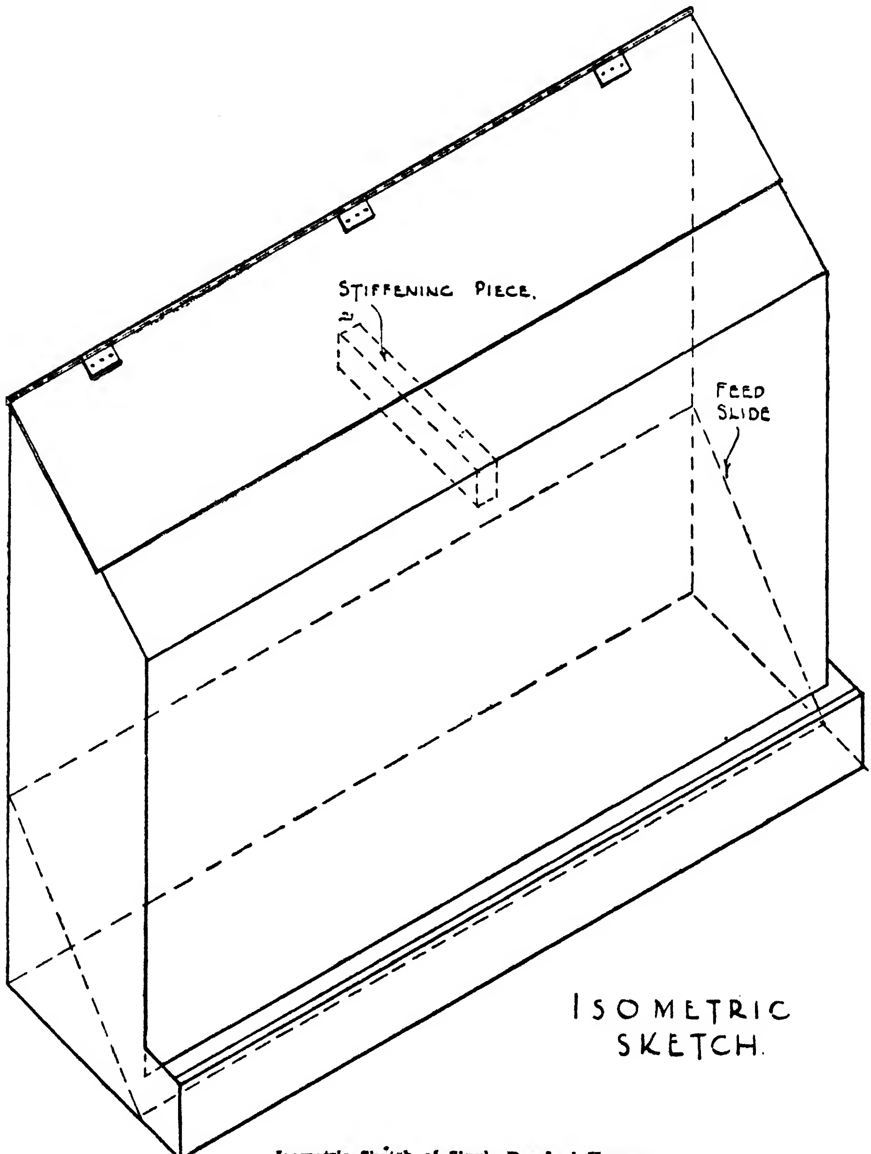
Still another aspect of the matter is that the cockerels hatched late in the season are, as a general rule, a dead loss, whereas those hatched earlier should, at any rate, pay for their rearing.

How to Ensure Good Development.

The main factor in rearing young stock is to attain maximum development, and, although correct feeding plays an important part, if the environment is unsatisfactory the best of foods and feeding will not produce the desired results. Too often one sees fine sturdy chickens reared up to about three months old, and then, through lack of suitable accommodation, or through being left too long in small pens, they cease to develop, lose condition, finally sicken, and many waste away. It is then too late to restore them to normal conditions again, and they are an economic loss.

The way to avoid this checking of growth is to give the young stock as much range as possible after they have learnt to roost, but it is useless giving a large area of run if big batches of birds are placed in one house, irrespective of its size. The most satisfactory method of rearing the chickens from the roosting stage on to maturity is on the colony system. This, of course, involves devoting a large area of land to this purpose, but the results amply justify such a course. To be effective the birds should be housed in small batches of about fifty, and several houses can be erected in one large enclosure. A suitable size for such houses is 12 feet long, 6 feet wide, 6 feet high in front, and 5 feet at the back.

As a guide to the area of land required, a minimum of 100 square feet should be allowed for each bird. Thus, in a run of 150 feet long by 100 feet wide could be erected three houses of the size stated above, providing accommodation for 150 birds. If plenty of land is available a greater area could



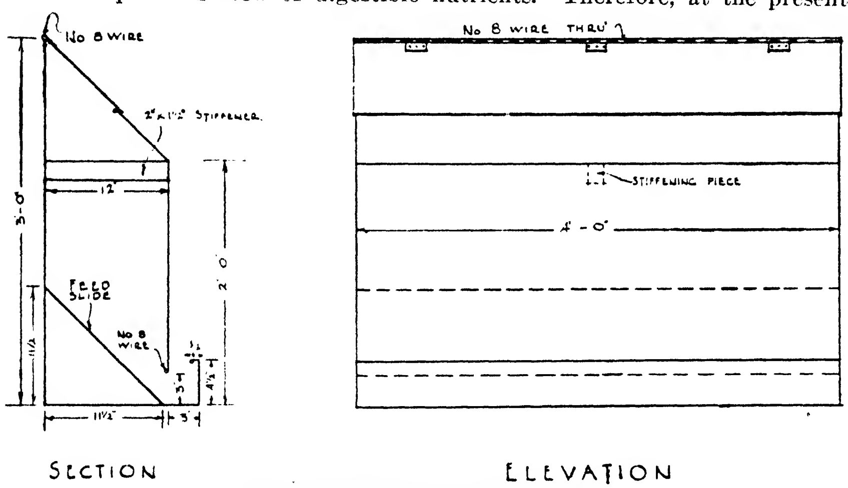
Isometric Sketch of Single Dry-feed Hopper.

be allowed with advantage. It is essential, however, to keep the birds confined in a small portable run around the house for a week after they are first put in, otherwise they will not stay in their own locality.

With the colony system, the yards, being so large, do not become contaminated, provided they are not kept occupied all the year. The chickens have plenty of exercise, keep clean and healthy, and grow into strong robust birds, which is so important in maintaining a profitable flock.

Economy in Feeding.

With the upward tendency of prices for the main poultry foodstuffs and the prospect of a lower wheat harvest this year, it becomes necessary to review the position as regards the cost of feeding. Drought conditions in parts of the State have caused an increase in prices of the staple foods and have also resulted in the prices of other commodities, which could be used, going up in proportion to their food value. For instance, oats at 4s. 9d. per bushel (the equivalent of 7s. 1½d. per 60 lb.) is dearer than wheat or maize from the point of view of digestible nutrients. Therefore, at the present



Section and Elevation of Dry-feed Hopper.

time, there is no substitute which could be used to cheapen the cost of feeding, except, perhaps, paddy rice (*i.e.*, rice with the husk on), which is available at about £7 10s. per ton, f.o.r. This is equivalent to approximately 4s. per 60 lb., to which would have to be added freight. Obviously, at that price, it would be no cheaper than pollard and bran if ground up and fed as a substitute. It can then only be considered as a supplement to the evening feed, and even for this purpose, its food value and palatability have to be weighed when making a comparison with wheat and maize. However, as there is no previous experience to show whether paddy rice can be used with advantage in feeding fowls, it has been decided to carry out a test at the Government Poultry Farm, Seven Hills, firstly, to determine its palatability, and, secondly, to ascertain its effect on egg production. If, of course, the birds do not, within a reasonable time, show any liking for the rice, egg production is sure to be adversely affected.

Seeing that the field of substitutes is extremely limited, the next question to consider is in what other direction we can look to keep down the

cost of feeding. It is in this connection that each individual poultry-farmer should review his methods of feeding to see if economies can be brought about without loss of production, but it has to be borne in mind that any sudden change in even portion of the ration may result in a set-back to production for a time, and, therefore, any changes should be made gradually.

There is an inclination among poultry-farmers to adopt many expensive compounds, all of which tend towards increasing the cost of production, mostly without any compensating results. What occurs in many cases is that during the period of low production the farmer, in an endeavour to increase the egg yield, resorts to the use of some preparation, which, it is claimed, will stimulate egg production, and this is probably at a time when the birds would just be coming on to lay again, and consequently when the egg supply does increase it is attributed to the preparation used. The fact is overlooked that without properly conducted tests with adequate check pens the results of using any foodstuffs or system of feeding cannot be relied upon. Even in the most carefully planned experiments the variation noted in the different pens fed on the same food is often remarkable and renders it difficult to draw definite conclusions. This being so, it will be realised that little value can be attached to casual trials under anything but uniform conditions.

Those who are inclined to try all alleged egg-producing mixtures that come on to the market would do well first to consider the cost of such, and then study the methods of feeding adopted in egg-laying competitions here and elsewhere; also look around among many successful poultry farms and note the results obtained on simple balanced rations.

Avoid Wastage of Feed.

Another direction in which the cost of feeding is often increased is on account of wastage due to faulty feed hoppers, or by over-liberal feeding with wet mash. In these days of increasing dry mash feeding, there are numerous different types of feed hoppers in use, many of which are so constructed that much wastage occurs, although it is often not noticed because the birds quickly scatter the spilled food among the refuse on the floor.

One of the chief faults noticed in feed hoppers is in the tray from which the birds feed. In some it is too shallow, or the front wall of the hopper does not come low enough, and therefore the feed comes out to the level of the top of the tray, which allows the birds to scratch it out easily. Others have the tray too wide, thus permitting the birds to scratch the feed out, but much of this trouble can be overcome by having a flange on the inside of the tray to make it more difficult for the feed to be worked out onto the floor.

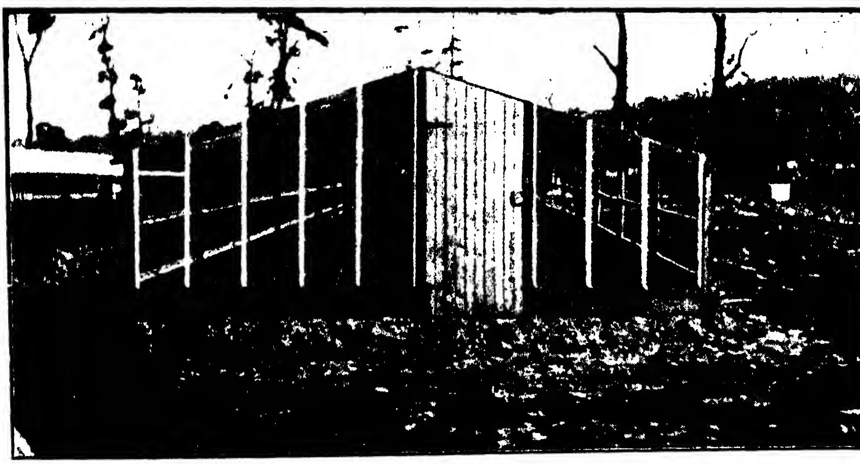
The accompanying illustrations show a suitable class of dry-feed hopper for a flock of approximately 100 birds, and will hold about a week's supply for that number. If desired, a double-sided hopper can be made on the same plan. Large helio copies of the plan are available for loan to poultry-farmers requiring them.

CONTENTS.

Tomato Culture Under Glass.

A. J. PINN, H.D.A., Special Agricultural Instructor.

THE culture, on a commercial scale, of tomatoes under glass, while comparatively new in New South Wales, has been carried out in South Australia for the past twenty years. A rapid increase in the area devoted to this method of cropping has taken place in recent years in the vicinity of Adelaide, until to-day it is estimated that the area cannot be far short of 100 acres. Apart from a few isolated houses, first at Mathoura and then Barham, both in the south-western area of this State, little attention was given this method of tomato culture in New South Wales until recently. The possibilities within the coastal areas have only been explored during the past two years. During the winter of 1928 there were approximately fifty glass-houses in use within this State, and this winter the number was in the vicinity of 200.



End View of Tomato Glass-house.

The mere mention of glass-houses generally conjures up in the mind of most people a large capital outlay, and that is the chief reason, no doubt, why so few growers have interested themselves in the commercial possibilities of tomato production under glass. The type of structure which most people usually visualise is that in common use in Great Britain and European countries. These structures are certainly expensive, but fortunately it has been found by the pioneers of this industry that in many localities the climatic conditions are such that comparatively inexpensive structures can be utilised, which do not call for nearly as much attention in operating as the Continental type of house. Furthermore, in the case of the Australian type of house, the crop can be grown during the coldest winters in many

localities without resort to heating. During recent months exceptionally cold conditions have ruled—probably the worst for thirty years, as far as the metropolitan area is concerned—but the bulk of the tomatoes in the glass-houses have suffered very little. Practically no damage has been reported from areas close to the seashore, but some frosting resulted in houses located a little farther inland. It has, therefore, been demonstrated that the climatic conditions in many central coast districts are favourable for the use of the Australian type of glass-house.

The Prospects of the Industry.

New South Wales is largely dependent on Queensland for its supply of tomatoes during the winter and early spring months. In the six months July to December, 1928, importations of tomatoes from Queensland were as follows:—July, 63,183 half-cases; August, 41,332; September, 35,344; October, 79,995; November, 40,965; December, 23,232.

The average market prices ruling on the Sydney market during that period, as arrived at from fortnightly newspaper reports, were as follows:—July 12s., August 13s., September 20s., October 27s., November 15s., December 14s. 6d. At the monthly average values quoted, the importation during that period represented a value of £255,677.

It is therefore apparent that, providing tomatoes of good quality can be produced locally during these months, there is a market to absorb the product. As regards quality, there need be no fear. The tomatoes marketed last season from the glass-houses were infinitely superior to the imported product, and prices were much in advance of those quoted. By reason of the fact that tomatoes transported over long distances to market must be picked almost green, it is quite obvious that they cannot compare in quality with fruit brought to maturity on the vine in close proximity to the market. I am of the opinion that the Sydney market could absorb quite easily the product of 1,000 glass-houses (standard size), and even then I venture to predict that the better-quality tomatoes offering will result in the market absorbing greater quantities than at present. No doubt many readers have seen and used the artificially-ripened tomatoes (those pink, anaemic, almost flavourless fruits) that are on the market during many of the months when no local tomatoes are available, and wonder if they are really worth buying. I know of many people who will not purchase such tomatoes, but would readily do so if quality tomatoes such as produced in glass-houses were available.

The financial results up to the present have certainly been satisfactory to the bulk of the growers. While many of last season's glass-house tomatoes were sold at prices between 30s. and £2 per half-case, it is not expected that future realisations will be quite so high. Probably the best answer to the question as to whether this method of culture is profitable is that nearly every glass-house tomato grower has enlarged upon his previous number of houses. While there have been odd failures, the yields throughout are mostly very satisfactory. Two local growers reported yields equivalent to 150 half-cases per standard house of 100 feet length. There were many with

average yields of 80 to 100 half-cases per house. One grower in South Australia secured a yield of 3,000 half-cases from 1,636 feet run of house, which is equivalent to a yield of 182 half-cases per 100 feet house.

Types of Glass-houses in Use.

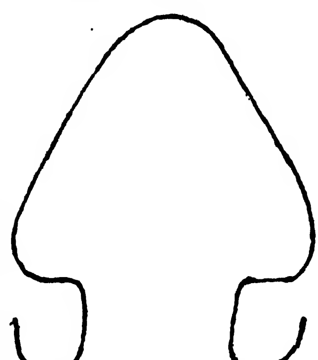
The standard Australian type of house is one approximately 100 feet long and 15 feet wide, with side walls 3 feet 6 inches high and 6 feet in centre at gable.

There are, of course, many variations in the structure of the houses, such as those constructed on other than level land, and also the large type of house which covers a greater area of land in proportion to the amount of glass used.

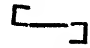
Many growers now favour higher houses than the standard type, and of late quite a number have been erected having sides 4 feet 6 inches to 5 feet high and 7 to 8 feet at the gable. The cost is certainly increased, but the larger air capacity of such houses maintains a more uniform night temperature. The increased height also provides more comfortable working conditions. In this article, however, it is only proposed to deal with the standard type house, with minor modifications. The particulars of construction are as follows:—

The houses are constructed of hardwood posts 3 inches x 2 inches or 3 inches x 3 inches. These are placed in rows about 7 feet apart. The usual height for the centre posts is 2 feet 6 inches higher than the side posts, but many houses are now constructed with a greater height at the centre, *e.g.*, a house with 3 feet 6 inch sides may be 7 feet at top of gable, or the same pitch may be given when sides are slightly higher. Along these lines of posts 3 inches x 2 inches Oregon plates are fixed. These may also be strapped to the posts by means of hoop iron in order to make a stronger job.

During the early years of construction grooved wooden rafters only were used. These were nailed to the top of the side plate and the ridge pole, and the glass was pushed along the grooves. Of recent years a galvanised-iron rafter has been patented, and is now almost exclusively used. The galvanised rafters have many advantages over the wooden ones, as, apart from the elimination of warping, they are more rigid and provide a small guttering which reduces roof drips to a minimum. The galvanised rafters commonly used are 8 feet long, and these are affixed to the roof by nailing (with a 3½ inches "grip well" nail) to both ridge and side plate. It is advisable to allow about 2 inches roof overhang at the sides, and this must be taken into consideration, and also the pitch of the roof, when determining the



Section of Galvanised Rafter.

width of the house. Where the centre posts are 2 feet 6 inches higher than the side posts the width of the house outside the posts is approximately 14 feet 8 inches. The lower glass between the rafters is held in position by a piece of galvanised iron nailed on the side plate midway between the rafters, and brought out and bent over the lower end of the pane. The balance of the glass panes are then held in position by clips in such a way that the pane above overlaps the pane below about one-quarter of an inch. The clips are shaped thus— 

The standard size glass in use is 16 inches x 14 inches, and with longest measurement between rafters it will take seven panes of glass for each section from ridge to eave.

The sides are filled in by first nailing a hardwood board, usually 4 to 6 inches wide and 1 inch thick, along the posts with the bottom edge level with the surface of the ground. Next, a piece of 2 inches x $1\frac{1}{2}$ inches Oregon is butted on to this hardwood board, and then secured by nailing to the posts. The Oregon is grooved on the upper side only. Another piece of 2 inches x $1\frac{1}{2}$ inches Oregon, grooved on both sides, is nailed higher up the posts at a distance suitable to the size of glass in use. In the past it has been usual to groove the 2 inches x $1\frac{1}{2}$ inches Oregon strips to a depth of 3-16 inch, but it is advisable to make the under groove of those strips that are grooved on both sides $\frac{5}{8}$ inch deep. This deeper groove simplifies the placing in position of the lower panes of grass, the upper edges of which are pushed into the deep groove, and can then be let down into position in the lower groove. With a 3-16 inch groove on the upper edge and a $\frac{5}{8}$ inch groove on the lower edge a 2 inch strip is not sufficiently wide, and should be increased to $2\frac{1}{2}$ or 3 inches in width. The extra depth of the groove is also advisable on account of shrinkage. With 3-16 inch grooves it takes very little shrinkage of the Oregon to cause the lower glass to lose its grip on the upper edge, but with a $\frac{5}{8}$ inch groove no such trouble occurs. The lower glass of the side is placed between the grooves of the two pieces of Oregon, and the top panes are held on the lower edge by the groove in the Oregon and at the top by a wire running along the side of the Oregon plate. Room can always be found between the panes of glass to staple the wire to the side plate. By fixing the top panes in this manner it is easy to remove them, if necessary, for ventilation purposes.

Each end of the house is provided with a wooden door, and the balance of the space is filled in with glass in a manner somewhat similar to that adopted in the case of the sides, that is, by slipping it in between grooved Oregon boards. An alternative method is to place the grooved Oregon boards in a vertical position, and have the glass overlapping slightly, as in the case of the roof. In place of grooved Oregon, galvanised rafters may be used in a vertical position.

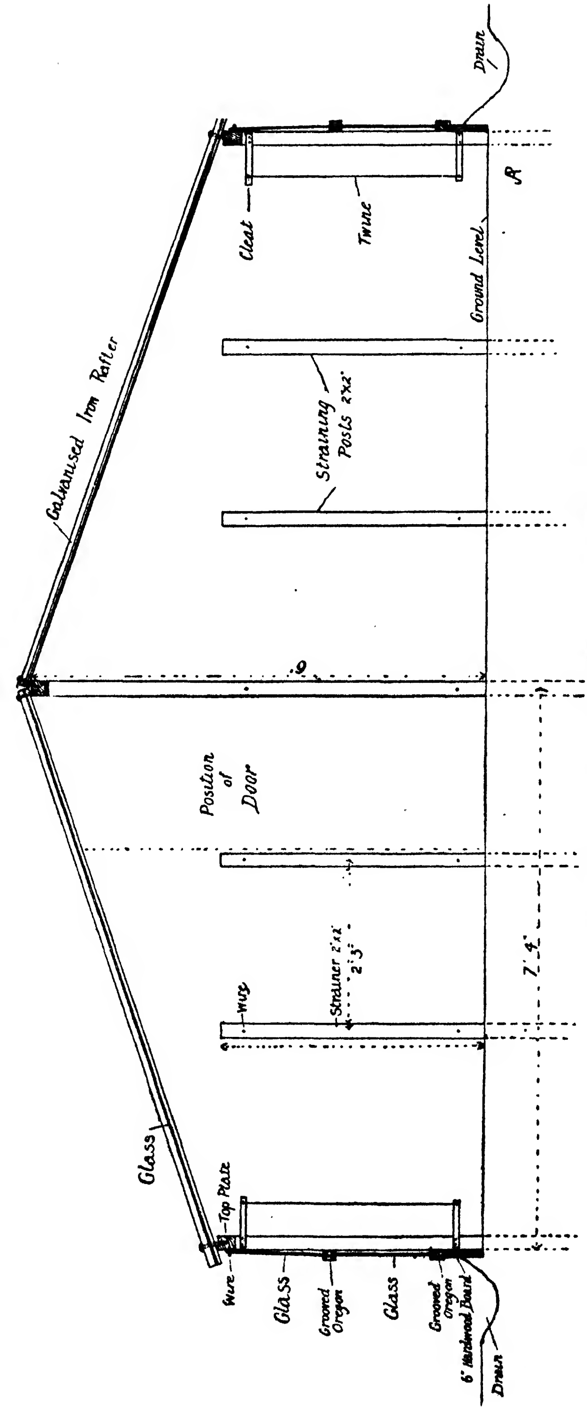
Sixteen- or 18-ounce glass is mostly used, and a grade below "thirds," known as tomato glass, is procurable at a reasonable price. Such a glass can be indented at a landed cost in Sydney of about 18s. to 19s. per case of 100 square feet. Spot price for small quantities (twenty-five cases) of this glass

is usually procurable at a little more than £1 per case. For a house such as that described, about twenty-five cases of glass would be required. This amount would provide a reserve in case of breakages.

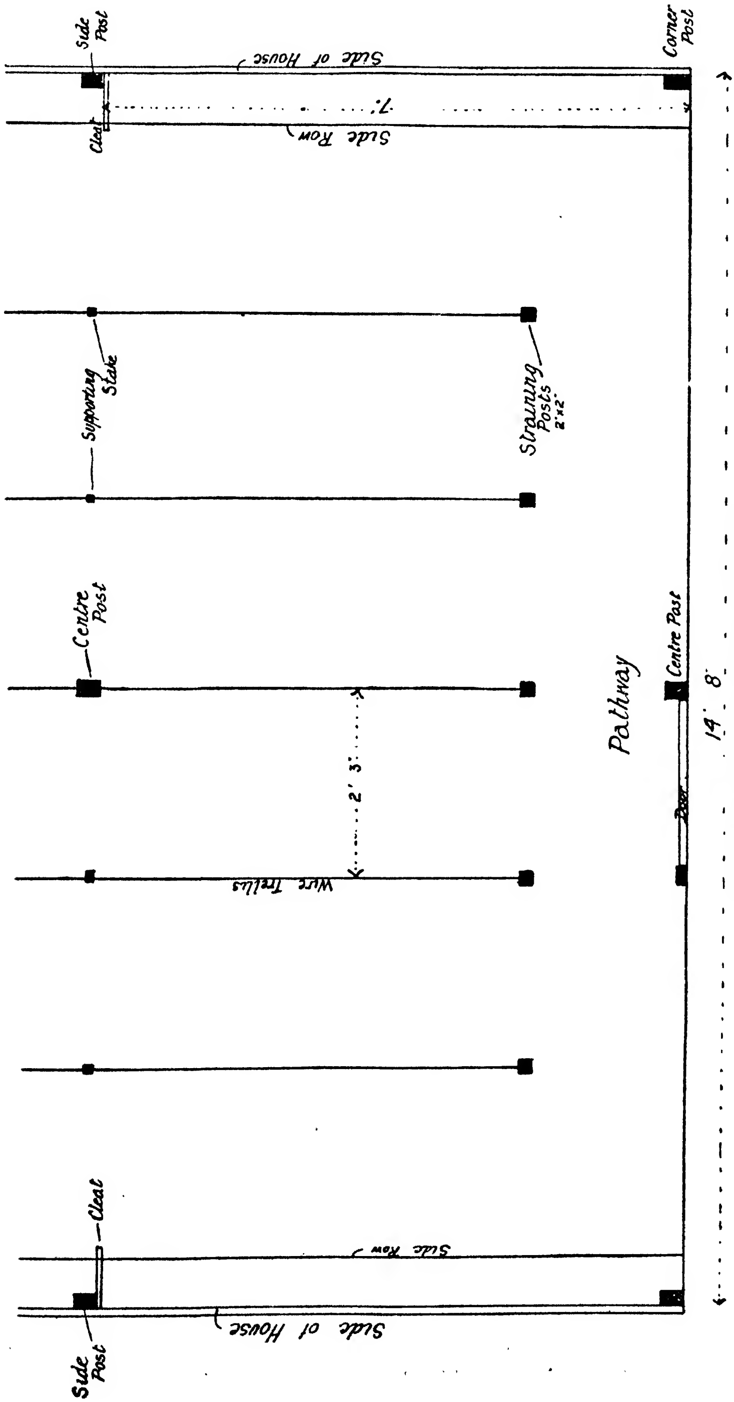
The materials in a standard house should be obtainable in metropolitan areas for not more than £50. In districts removed from Sydney the freight on glass is rather a heavy charge. If it is considered advisable to protect from hailstones, the roof should be covered with fine-mesh wire netting. The extra cost of doing this job with ½ inch netting would mean another £7 approximately. Additional material in the way of hardwood stakes, wire, and twine are required for supports for the plants within the house. A drain should be made along the side of the house, as, unless the roof water is well removed from the side, the outside rows of plants are likely to suffer. The labour cost of erecting a standard house is about 1s. 6d. to 2s. per foot length of house, *e.g.*, a 100-foot house would incur a labour cost of £7 10s. to £10.

Showing Interior Lay-out of Tomato Glass-house.

To support the plants, two parallel horizontal wires are used in each row. The bottom wire is placed a few inches above the ground, and the top one approximately 3 feet 6 inches higher. In the case of some tall varieties which can be grown in the centre rows of the house, provision should be made for a higher wire. As regards the two outside rows, the wire can be run the full length of the house and affixed to the ends of the house. In the case of the centre row the supporting posts can be used. As the rows of plants are spaced about 2 feet 3 inches apart, this provides two additional rows on each side between the centre and outside row. In the case of these rows it is usual to insert a straining post about 2 feet in from each end of the house rather than secure the wires to the end of the house. This then provides for easy access to each row when entering the



Sketch Giving Details of End Elevation of Glass-house.



Sketch of Ground Plan of End of Glass-house.

door. Along the lines of wire hardwood stakes are used as supports, usually spaced the same distance apart as the main posts of the houses. The plants are spaced approximately 1 foot apart in the rows, according to variety and fancy of the grower. For each plant a twine is provided. The twines are secured to the top and bottom wires to correspond with the placing of the plants in the rows. The plants are trained to a single stem and twisted round the supporting twine as they grow.

Suitable Districts.

As already stated, the most suitable district is one in close proximity to the sea. In such areas the night winter temperature is usually more temperate than farther inland. In these localities frosts seldom occur. Undoubtedly the chief centre of activity at present in New South Wales is in the vicinity of Warriewood, near Narrabeen, where there are now about seventy houses of various sizes in operation.

Glass-houses are to be seen in many of the outlying suburbs of Sydney, and also at such centres at Penrith, Mount Druitt, Fairfield, and Glenfield. The past winter has been somewhat severe in these last-mentioned localities, and in one case a grower reported an outside temperature of 20 degrees Fah., but by the use of kerosene heaters was able to keep the temperature well above freezing. In another case, where no heating was provided, the temperature dropped to 30 degrees Fah. in the house, but the frost damage to the plants was confined chiefly to the end of the house, which first came under the influence of the morning sun. The placing of bagging round the house during the winter nights previously prevented frost damage.

Further north, near Gosford, Lisarow, Tuggerah, Cardiff, and Woodville, houses have been erected, and there has also been an increase in the number erected in inland areas, in which localities heating of the houses is usually necessary, owing to the lower night temperatures. Where heating is necessary, the cost of installing a circulating hot-water system is almost equivalent to the cost of the glass-house structure. For such heating it is usual to instal boilers which use coke as fuel, such as is commonly used in poultry brooder-houses. While it is considered that nearness to Sydney market offers advantages in the marketing of the product, there should be many centres, particularly along the coastline, which, besides being climatically suitable for production, should also be able to absorb the product of a number of houses.

Effect of Low Temperatures.

The frequent dropping of the temperature in the glass-house to anything approaching freezing point is regarded as unsatisfactory, as under such cold conditions condensation of the atmospheric moisture takes place and lodges on the plants in the form of dew. This continual wetting of the foliage is likely to result in the appearance of certain fungous diseases, unless some method, such as the application of a fungicidal dust, is used to counteract the trouble. Such low temperatures also cause a poor setting of fruit, and if setting takes place under low temperature conditions it will often be found that the fruits formed are "flabby" and without seeds.

When visiting glass-houses in Victoria some years ago I was afforded an example of the detrimental effect of too low a temperature. One grower, who was without heating facilities, experienced much foliage disease in plants, and a most irregular and poor setting of fruit on the first and usually most valuable bunches. These early sets are produced in the cooler months. Another grower, who was able to regulate his night temperatures by heating, had no foliage disease and an excellent setting of fruit.

While dealing with the effect of temperatures, it would not be out of place to quote from a report of Dr. Bewley, of the Lea Valley Tomato Glass-house Research Station in England. He states:

> When seeds are sown (December in England) it was found that the soil temperature must be kept at 60 degrees Fah., and in no case allowed to fall more than 3 degrees below that point if root growth, and indeed the growth of the whole plant, is to proceed steadily. A soil temperature below 57 degrees Fah. checks root and stem growth, some roots die, and the leaves turn purplish-green. An equally close relationship exists between air temperature after planting and crop production. During the growing season air temperatures varying from 55 to 70 degrees Fah. were maintained. At an air temperature between 63 degrees Fah. and 65 degrees Fah. growth was excellent, fruits set freely, and weighed twenty-eight per cent. more than those obtained when the air temperature was 3 degrees lower (60 degrees Fah.) or 5 degrees higher (70 degrees Fah.). As compared with growth at 63 degrees Fah., that at 60 degrees Fah. was sturdier, darker in colour, and slower; whilst at a yet lower temperature, 55 degrees Fah., plants were greatly retarded, and their leaves signified their discomfort by assuming a purplish hue. At 70 degrees Fah. the growth was too rapid and soft.

The temperature mentioned in that report would probably only refer to the winter period. This is undoubtedly the critical period in glass-house tomato production, as once sturdy, healthy growth and good setting is secured, the higher temperature, which comes with the spring and early summer months, together with feeding and watering of the plants, will accomplish the rest. In the early summer months temperatures of over 100 degrees Fah. are frequently met with in houses here, but at this stage it would appear wise to spray the outside of the roof and sides of the house with whitewash. I have noticed that many of our local growers keep their houses shut up too much during the winter months, and the range in temperature is certainly much greater than that quoted. Ventilation during the winter months is very necessary, as at this period, owing to absence of sun, soft, sappy growth is likely to be formed, particularly when houses are kept closed owing to the dullness of the day. It is just at such period that ventilation is very necessary. Soft growth is more liable to become diseased and suffer from frost damage.

Finally, on the matter of temperature, I would again quote from Dr. Bewley's report:

> Environmental factors must be considered ultimately all together. The amount of sunlight which glass-house plants are allowed to receive must be considered in relation with temperature. Bright sunlight tends to counteract the growth softening effect of high temperature. Reduce the temperature in dull weather, and drive the boiler in sunny weather.

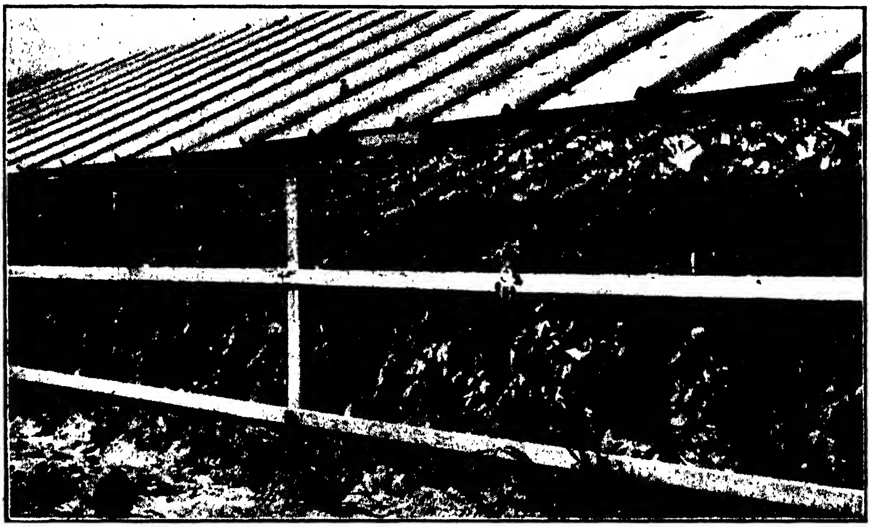
Fortunately, here we are blessed with much sunlight, and hardy growth is produced on most days, but occasionally it has been found that no provision is made for extra ventilation during a spell of dull weather. With the type

of house in use here some ventilation is provided for at all times—through the ridge, under the glass at the eaves, and through the galvanised rafters, &c.

The Site for the House.

If possible, a fairly level area should be selected for the erection of a glass-house, preferably in a position not exposed to southerly winds.

The house should be well clear of any tree growth which would be likely to cast shadows over the house. Houses running north and south are preferred, and it is well to remember that they are seldom allowed to remain in the same position more than four years.



Side View, Giving a General Idea of Construction.

It is a common practice, where a "battery" of houses is erected, to so space the distance between the houses that the intervening width of land is equivalent to the width of a house. When it is desirable to move the houses onto the new land in between it is not necessary to move the side posts and plates.

Soil Requirements.

Endeavour to select a clean area, *i.e.*, one that has not previously grown tomatoes. This is most important in regard to certain diseases, such as fusarium wilt, which is probably the worst trouble experienced in houses here. A clean start in this respect will mean that the house can remain in the same position for a greater number of years.

Heavy clay soils are unsatisfactory. They are too cold, and compact badly when pruning and other operations are being carried out in the house.

A sandy loam is to be preferred. Such soils are warmer and root growth is more active, and manures and fertilisers are more quickly availed of. They are easy to cultivate, and although some may present difficulties when watering, through being too open, they are certainly well drained.

Fertilisers.

Bonedust is a favourite fertiliser, and is applied during the early preparation of the soil. Many growers use this fertiliser at the rate of a bag to a standard house. Potash fertilisers, used at the rate of 30 to 50 lb. per standard house, are often beneficial, particularly in sandy soils. This fertiliser gives strength to the plants, and is particularly advantageous when a dull winter is experienced. Superphosphate should be applied just previous to the setting out of the plants in the house.

A Battery of Tomato Glass-houses at Warriewood.

Little or no nitrogenous fertiliser is required during the early period of growth. The nitrogenous fertilisers are more advantageous after the fruit has set and it is necessary to feed the plants for filling the fruit. Sulphate of ammonia is particularly useful during the spring and summer for this purpose, and is preferably applied just previous to watering. It is better to give light and frequent applications than one or two heavy ones. One pound per row should be quite satisfactory before watering.

Poultry manure is also valuable for application as a top-dressing before watering. This manure, and indeed any stock manure, should not be used if there is any likelihood of the birds or animals having received, as feed, any vegetable scraps containing diseased tomato fruits. Applications of poultry manure at the rate of as much as five kerosene tins per row have been made with satisfactory results. This manure should always be kept on the surface and not dug under. Cow manure is particularly valuable for digging in during the early preparation of sandy soils.

Raising the Plants.

Every possible care should be taken in raising good, strong, healthy plants. Clean soil of a sandy loam nature, to which a little superphosphate has been added, should be used. After raising, in the seed-boxes or seed-beds, the young plants should be thinned out after obtaining their first rough leaf, so that they will be not less than 4 inches x 3 inches apart. This space allows of the sturdy development necessary. Give as much sun as is possible, but protect from winds. Keep the plants covered with glass, if necessary, during wet weather and at night, but always provide the necessary ventilation.

By sowing the seed in March and April the young plants should be ready for placing in their permanent position in the glass-house during May and June. Plants set out in the house during May should provide fruit for market in August and later.

Prices ruling during the cooler period of the year are low in comparison with those obtained later. With the advent of spring, and warmer days, the demand for tomatoes increases rapidly, and it is therefore advisable to time planting so that the bulk of the fruit from the glass-houses is available during September, October, and November, and before the early outside areas become a factor in supplying the demand.

Varieties for Glass-house Culture.

For the low type of house in use, strains of the Australian or Chinese Red variety are in general use. The commonest strain of this variety is known as Early Dwarf Red, or Adelaide Dwarf Red. At the present time this variety probably represents 90 per cent. of the varieties under cultivation in glass-houses. This variety will usually set fruit under cooler conditions than most other varieties. The growing of the small English Cluster type has, so far, not met with much success, but more may be heard of this type, as of other smooth skins, at a later date, when, no doubt, larger houses will be employed.

Among the tall smooth-skin types sometimes grown in the centre rows of the house, where greater height exists, the variety Bonny Best has done fairly well. This is a Canadian glass-house variety. Its fruit is certainly of excellent quality, and a grower on the Murray River, at Borham, reported that he had had good results and secured 4s. per case more for it than for the Chinese on the Melbourne market. In the case of the Chinese variety it is necessary to pinch out the "ram" flower, which is the large, first flower formed in the bunch. This flower produces tomatoes of undesirable shape.

Pruning.

The plants are pruned to a single stem, and as each new growth at the junction of the leaf and stem appears it should be broken out. It is generally suggested that this shoot should be pinched or cut out, but I prefer to see

these broken out with a side pull while quite tender, and before the shoot is so big as to necessitate pinching or cutting out. Anything that can be done to diminish the risk of conveying disease from one plant to another is most desirable, and for this reason the method suggested should be followed. It, of course, necessitates going over the plants at more regular intervals. In pinching out, or cutting out, the fingers or knife come in contact with the juice of the plant, and therein lies the risk of carrying infection. When the young shoot is broken no such risk occurs.

It is also advisable at times to "leaf prune," chiefly for the purpose of allowing ready access of light to help in ripening the fruits. When pruning or leaf pruning has been done the plants should be dusted with some dry, fungicidal powder, such as a mixture of sulphur and Bordeaux powder. This dusting will dry all sappy exudations at the point of severance, and will largely prevent infection from such diseases as stem girdle.

On no account burn sulphur in the houses. This will result in the destruction of the plants.

After-cultivation and Watering.

Keep the soil between the rows regularly tilled, particularly after such operations as pruning and tying, and also as soon as possible after watering. A pronged hoe is very useful, if no other implement is available, for keeping the surface stirred.

It is usual to draw the earth in slightly to the plants after they are established. This allows of the formation of a slight depression between the rows for watering purposes and at the same time, by banking up against the stems, fosters the development of new roots.

An assured water supply is necessary, particularly during the summer months. In winter it is desirable to keep down watering to a minimum. A wet soil in winter means a cooler soil, and this retards growth. A wet soil also means a greater humidity in the house, and consequently more likelihood of disease trouble during winter months.

The usual method of watering is by furrow irrigation. For this purpose a fall of 1 in 100 is desirable. On sandy soils a greater fall can be given than on those of a heavier texture. Spray irrigation is not advisable, as the wetting of the foliage creates a condition suitable for the development of certain fungous diseases, and if watered in this manner when in flower usually prevents the proper ripening of the pollen, and thus results in a poor set of fruit.

On very sandy soils a good head of water is necessary in order that water will reach the full length of the row without too great a loss by percolation at the end near the inlet. Where only a low-pressure supply is available lengths of hose will be found necessary to convey water to various points of the house, thus allowing watering to take place over smaller areas.

With some varieties, cracking of the fruit is very pronounced, and to a large extent is brought about by uneven moisture supply to the plants.

Should soil become low in moisture content when fruits are well formed, cracking, due to the increased sap flow, will often occur after a watering is given.

Pollination of Flowers.

Bees are not necessary in pollinating. It is found that working among the vines is usually sufficient to distribute pollen from the anther (pollen sack) to the pistil.

Sanitation in the Glass-house.

At the end of the tomato season it is advisable to fumigate the houses in order to dispose of any insects harbouring on the old bushes. Old bushes should be removed and burnt at the first opportunity.

Every precaution possible should be taken to fight diseases. The surroundings of the houses should at all times be kept clear of rubbish and growth, so as not to harbour thrips. Periodical sprayings to control such insects as thrip, white fly, and aphis are suggested, as these play an important part in the spread of many of our tomato diseases.

Leaflets dealing with the various fungous diseases are available on application to the Under-Secretary, Department of Agriculture, Sydney.

Control Measures for Citrus Scab.

Citrus scab is best known to orchardists as a serious disease of lemons, especially in coastal district, although in wet seasons it may also attack mandarins—the Unshin mandarin is very susceptible—oranges, and other citrus fruits. The disease does not damage the interior of the fruit, but the scabby or wart-like growth on the skin of the fruit spoils its appearance for market, and the disease is often responsible for extensive shedding of young fruit.

Fortunately, the period during which foliage and fruit are liable to become infected is comparatively short, and this makes it possible to protect the fruit very effectively by spraying with Bordeaux mixture (6—4—100) plus 1 per cent. red spraying oil *as soon as possible* after most of the petals have fallen from the main crop blossom in spring. Harvest all mature diseased fruit before the main blossoming commences. Pick up and burn all fallen fruit, and prune and burn all badly diseased twigs when thinning. In cases of severe infection a second spraying should be given to the lemon crop, which sets usually about January or February, and here again the spraying should be carried out as soon as possible after most of the petals have fallen.

It is not advisable to apply the spray during droughty periods. Bordeaux mixture tends to increase the liability of trees to scale infestation; but if the spray be applied chiefly to the outer fringe of foliage so as to cover the young fruit, and not applied heavily to the inside of the tree, this tendency will be prevented to some extent. It is advisable, however, to use a red oil spray in January or February to control the scale insects or to fumigate prior to applying the Bordeaux spray. It is dangerous to fumigate within six months after once spraying with Bordeaux.

Sweet Potato Trials, 1929.

Points Brought Out by Last Year's Experiments.

Farmers' Experiment Plots.

J. DOUGLASS, H.D.A., H.D.D., Agricultural Instructor.

THE past season for sweet potatoes has been remarkable for the varied weather conditions experienced in different parts of the State. Conditions on the far north and central north coast were very satisfactory for the crop. On the central coast a very dry and late spring was experienced, with the result that the parent tubers failed to produce early "shoots." resulting in late transplantations. Plagues of grubs (the larvae of the hawk moth) completely defoliated many crops, resulting in greatly reduced yields.

In the western districts one of the most essential features to successful sweet potato growing is the early raising of the "shoots." This season farmers who failed to obtain early plants found that the crop was frosted before maturity, resulting in low yields. The season in the western districts was very dry throughout, with early frosts. Growers who practise early field planting and correct irrigation methods obtained excellent yields. This year's results in the western districts confirm the opinion that not only is the sweet potato the most prolific root crop to grow in these districts, but that yields can be produced equal to those produced in any portion of the State.

The Variety Trials.

Sweet potato variety trials were conducted throughout many districts in the State to ascertain, firstly, the most suitable variety for each district, and, secondly, to popularise and encourage the production of the improved, better quality varieties.

YIELDS in Variety Trials.

	H. Eastwood Tascott.	S. Redgrove, Branxton.	W. Cole, Wellington.	W. T. Sunderland, Dubbo.
	t. cwt. qr.	t. cwt. qr.	t. cwt. qr.	t. cwt. qr.
Yellow Strassburg	3 16 2	8 0 2	4 0 0	15 16 3
Nancy Hall	3 7 1	7 13 1	2 18 0	15 2 2
Southern Queen...	6 3 2	7 1 3	3 6 0	13 6 2
Pierson	7 6 0	......	......	......
Director	4 3 2	......	4 9 3	......
Porto Rico	......	7 1 3	......	......
White Maltese	......	......	......	8 3 2

A novel feature introduced into the variety trials this year was a vineless sweet potato. This was obtained from Mr. W. L. Waterhouse, of the Sydney University. The fully-grown plant produces only short runners (up to 12 inches in length) with an abundance of foliage. The roots are

produced in a heavy cluster directly under the plant, and those produced this year were smooth, long oval in shape, and with skin of a dull golden colour. The flesh, which is yellow, is of fair quality when cooked. This variety appears to be of little commercial value compared with other varieties, but should be useful to "backyard" gardeners. Owing to the scanty nature of the vines and the general habit of the plant, this variety can be planted much closer than other varieties.

W. T. Sunderland, Dubbo.—This grower has made a special study of sweet potato growing over a number of years. The cuttings used in the variety trial were transplanted on 23rd October, and produced an early top growth. A commercial area grown by Mr. Sunderland was not transplanted until December, the result being that early frosts destroyed the foliage and considerably reduced the yields. Mr. Sunderland has now definitely decided on growing large areas of Nancy Hall and Yellow Strassburg. Both these varieties are of high quality compared with White Maltese. The Dubbo public at first did not take kindly to the better quality varieties, owing to their comparative dryness and high sugar content.

W. Cole, Wellington.—This variety trial made exceptionally good growth during the summer. It is found that sweet potatoes form up the bulk of their roots in the last few weeks of growth. In the dry districts it is very necessary to irrigate heavily at this period. Owing to illness Mr. Cole was prevented from irrigating at the desired time, and this had the effect of greatly reducing the yields. Director produced the heaviest yield, and judging by the number of small tubers formed would have produced a very heavy crop had the conditions been normal.

S. Redgrove, Branxton.—The seed roots from the previous year's crop were placed in seed-beds on 12th October, 1928. These roots shot away immediately, producing an abundance of early shoots, which were transplanted into the field on 5th November, 1928. The soil is white, raw sand with a subsoil that has remarkable water-holding properties. The crop was fertilised with equal parts of bonedust and superphosphate at the rate of 3 cwt. per acre. Rapid top growth was made, and the crop appeared to be forming up well when the larvae of the Hawk moth appeared in plague numbers, devouring every vestige of foliage in the paddocks. The plants were prevented from making new growth, with the result that yields were much lower than anticipated. Yellow Strassburg produced the highest yield (over 8 tons per acre) and is one of the varieties best suited to this locality. Mr. Redgrove has favoured Porto Rico since the innovation of these trials, owing to its exceptionally high culinary quality. This variety does well in the raw sands, although it was noticed this season that several roots were badly cracked. Pierson, a very promising white variety matured too late to be weighed for the purpose of the trials, but it should do well if planted early.

H. Eastwood, Tascott.—This property is situated on the waterfront of Brisbane Water in the Gosford district. The soil is a light sandy loam and eminently suitable for sweet potatoes. Unfortunately Mr. Eastwood's land is very limited in area, with the result that a very intense system of

rotation is practised. It was found that sweet potatoes would have immediately to follow early beans, hence only very early-maturing varieties were suitable. The land had been previously cropped with beans, tomatoes, beans, the residue of the latter crop being ploughed under 10 inches deep during November. The land was fertilised with M. 22 mixture at the rate of 4 cwt. per acre. Unfortunately this land had been previously dressed with faulty manure, resulting in an excessive top growth.

Right through the growing period Pierson was outstanding, and produced the heaviest yield (7 tons 6 cwt.). Southern Queen produced the satisfactory yield of 6 tons 3 cwt. 2 qr. Regarding Director, Mr. Eastwood stated that it is the most prolific variety he has ever seen, and if it were possible to plant this variety early it should give outstanding results. Director is a late-maturing variety, and unless planted early the roots usually fail to mature.

The Manurial Trials.

A manurial trial was carried out on Mr. H. Eastwood's farm at Tascott. The object of this trial was to ascertain which fertiliser, or mixture of fertilisers, would produce the most payable increase in yield.

RESULTS of Manurial Trial.

Fertiliser Mixture.	Yield.	Fertiliser Mixture.	Yield.
	t. cwt. qr.		t. cwt. qr.
M22 (560 lb. per acre) ...	7 10 3	P12 (653 lb. per acre) ...	4 10 3
P11 (653 lb. per acre) ...	4 15 3	P13 (746 lb. per acre) ...	4 7 1
Superphosphate (560 lb. per acre)	4 14 1	No manure (check plot) ...	3 9 2

NOTE.—M22 mixture comprises equal parts superphosphate and bonedust; P11 contains 6 parts superphosphate and 1 part sulphate of ammonia; P12, 6 parts superphosphate and 1 part sulphate of potash; P13, 6 parts superphosphate, 1 part sulphate of ammonia, and 1 part sulphate of potash.

This trial suffered from the same disadvantages as the variety experiment conducted by this grower, hence the greatly reduced yields. The results obtained, however, are in the main similar to those obtained from previous trials in this district, and strengthen the recommendation for the general use of M22 fertiliser mixture, which consists of equal parts of bonedust and superphosphate. It is found that the superphosphate becomes available in the early stages of growth, greatly increasing root production, and the general growth and vitality of the plants. Superphosphate or mixtures containing superphosphate as a basis fail for various reasons to sustain the maximum stimulating effect right throughout the growing period. Sweet potatoes produce the greatest portion of their root growth in the last few weeks, hence it is at this period that the greatest amount of plant food should be available. The bonedust portion of M22 mixture is not readily available, and is being broken down by soil and weather conditions during the summer. The major portion of the plant food in bonedust only becomes available in the latter stages of growth, when it is most needed. The breaking down of bonedust is a very gradual process, thus M22 gives a very steady and uniform supply of phosphatic plant food over a

long period. In this trial P11 mixture produced the second highest yield. This has been the case in previous trials and appears to indicate that small amounts of nitrogen in conjunction with superphosphate are desirable. M22 contains a small percentage of nitrogen, and may, to some extent, increase the yield. The addition of potash to superphosphate in P12 and P13 mixtures decreased the yield when compared with superphosphate alone.

Grafton Experiment Farm.

R. J. DAVIDSON, H.D.A., Experimentalist.*

Variety, manurial, and propagation trials were carried out during the past season at this farm.

Droughty conditions ruled during spring and summer. One useful fall of rain in October and some storms in December and January afforded temporary relief, but the dry spell did not definitely break until 20th January. Following this change there was a superabundance of rain until harvesting. Some very hot and windy weather was experienced during the summer. The monthly rainfall was as follows:—July 291 points, August 63, September 24, October 146, November 63, December 455, January 479, February 858, March, 449, April 594.

Cultural Notes.

The trial was located on a sandy loam soil, on the lower slope of a volcanic ridge. The previous crop was sweet potatoes in 1926-27. The land was disc ploughed on 18th July, 1927, harrowed on 5th October, spring-toothed on 4th November, disc ploughed on 7th November, springtoothed on 15th December, disc ploughed on 9th March, 1928, disc harrowed on 15th and 27th March, disc ploughed on 3rd September, harrowed on 4th and 24th September, and 3rd October.

The Variety Trial.

The site of this experiment was again harrowed on 23rd October, and was in excellent tilth, a little dry on the surface, but with good mixture a few inches below. On 24th October rooted plants were watered in 2 feet apart in 3-feet rows. All plots were inter-row cultivated and volunteer plants hoed out on 1st November, cultivated on 7th November, and hoed on 21st December. The date of harvesting was 3rd May.

RESULT of Variety Trial.

Varieties in order of merit.	*Computed yield per acre.* t.	c.	q.	lb.	*Varieties in order of merit.*	*Computed yield per acre* t.	c.	q.	lb.
Georgia	14	17	2	10	Southern Queen ...	11	5	1	17
Director	14	8	3	0	White Yam	11	0	3	26
Nancy Hall	13	19	3	18	Triumph	10	18	0	4
Brooks' Seedling... ...	11	15	2	24	Pierson	10	6	1	0
Farmer's Special... ...	11	9	3	8	Porto Rico	10	6	1	0
Yellow Strassburg ...	11	6	3	14					

* It is with the deepest regret that we have to record the decease of Mr. R. J. Davidson since contributing this article.—ED.

Notes on the Varieties.

Georgia.—Very long, vigorous vines; green leaves with purple veins on under surface, and star (purple patch at junction of leaf stalk and leaf blade) on upper surface. Roots large, irregular and rough, mostly cylindrical in shape. This variety has again proved the heaviest yielder. It is a late maturer and the roots would have grown even larger had harvesting been later. Suitable only for stock fodder.

Nancy Hall.—Vines medium length, purple tint; leaves wholly green. A few roots rough and split, but mostly of good shape and size. Attractive appearance, good quality.

Brooks' Seedling.—Mr. Brooks states this is possibly Seedling No. 29. Vines about 10 feet long with purple tint; leaves wholly green. Roots mostly turnip-shaped, good size, and attractive appearance.

White Yam.—Long vines with purple tint; leaves wholly green. Roots mostly turnip-shaped, fair number small roots and good deal of splitting Appearance only fair.

Porto Rico.—This is a fairly early variety. Vines comparatively short and of purple colour; leaves have purple veins and star. It yielded much better than in previous years. Some big roots, mostly good shape, sound, clean, and attractive in appearance. An excellent table variety; flesh moist and sweet.

Manurial Trials.

The variety used was Southern Queen. Cuttings were dibbled in on 16th October, after an inch of rain, 2 feet apart in 3 feet rows. The soil was in excellent condition and moist. A good strike resulted. The plots were inter-row cultivated on 22nd October and 1st November, and cleaned with hoes on the latter date. Harvesting was carried out on 6th May, with the following results:—

RESULTS of Manurial Trial.

Treatment in Order of Merit.	Yield per acre.	Increase.	Value.	Cost of Fertiliser.	Net Gain.
	t. c. q. lb.	c. q. lb.	£ s. d.	£ s. d.	£ s. d.
M22 mixture (280 lb.), superphosphate (140 lb.), and bonedust (140 lb.)	12 1 3 12	16 1 23	3 5 10	1 5 9	2 0 1
Superphosphate (280 lb.) ...	12 0 0 6	14 2 17	2 18 7	1 2 0	1 16 7
P11 mixture (326 lb.), superphosphate (280 lb.), and sulphate of ammonia (46 lb.)	12 1 2 15	16 0 26	3 4 11	1 10 3	1 14 8
P13 mixture (372 lb.), superphosphate (280 lb.), sulphate of ammonia (46 lb.), and sulphate of potash (46 lb.)	12 3 0 23	17 3 6	3 11 3	1 18 6	1 12 9
No manure (check plot) ...	11 5 1 17	(Average of checks.)			

VALUATIONS.—Sweet potatoes, £4 per ton; superphosphate, 8s. per cwt.; bonedust, 11s. per cwt.; lphate of ammonia, 20s. per cwt.; sulphate of potash, 20s. per cwt.; applying fertiliser, 2s. per acre.

Remarks.

The complete fertiliser gave the highest yield, but the increase over superphosphate alone failed to meet the extra costs for the potash and ammonia. On the above valuations the most profitable fertiliser was a mixture of equal parts of superphosphate and bonedust. All fertilisers showed a profit over the unmanured plots.

The Propagation Trial.

A trial was planted to compare (1) rooted cuttings from previous seasons, (2) cuttings from present season's growth, (3) rooted plants from seed bed.

The yields obtained were: (1) Previous year's vines, 1 ton 13 cwt. per acre; (2) present season's cuttings, 4 tons 12 cwt. per acre; (3) rooted plants from seed-bed, 6 tons 12 cwt.

Remarks.

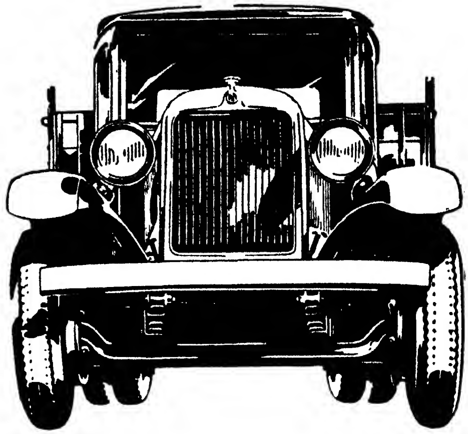
The block in which this trial was planted contains patches of "spewy" soil. These patches are badly drained and after heavy rain remain in a saturated condition for a considerable time. This condition is accentuated by soakage from higher land. At planting time, due to the dry weather, these patches were not discernible, and this trial was planted on a bad site. The wet weather during the latter end of January, February, March, and April resulted in a lot of roots rotting, and the yields are not comparable. It was noticed that the early vine growth of Plot 2 was the most vigorous.

Diseases.

Two diseases appeared in the plots, namely, scurf (or soil stain) and soft rot.

Scurf.—This disease occurs as brown spots on the roots, often spreading over almost the entire surface, producing a dark-brown coloured skin. It does not penetrate the potatoes, and the chief damage is due to the bad appearance of the roots. Loss in yield is slight, but badly infected potatoes lose half their weight or more by shrinkage when stored and become worthless. According to American investigators the fungus is stimulated by manures and other organic matter. The fungus is destroyed on the host by soaking the seed in one part corrosive sublimate to 1,000 parts of water for from eight to ten minutes. Scurfed potatoes should not be used for seed.

Soft Rot.—This is a serious storage disease, but is also found in the field, particularly in wet soil. There are no symptoms to indicate the presence of the disease other than at harvesting, when the roots are found to be soft and rotten. Heavy soil with poor drainage is conducive to soft rot. Injury due to rough handling facilitates the development of the disease in storage. The fungus is present in all soils and control is impracticable. Planting in light, well drained soil, proper cultural methods, and care in handling minimise losses.



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Wollongbar Experiment Farm.

S. C. HODGSON, H.D.A., Experimentalist.

Variety and manurial trials were again carried out at this farm during the past season. Both trials were planted on red volcanic soil, which was ploughed on 1st August, 1928, harrowed on 30th August, ploughed on 7th September, harrowed on 11th October, ploughed on 22nd October, and harrowed before planting.

Due to the presence of a supposed virus disease— curly top—during the two previous seasons, tubers grown at Wollongbar were not used for propagation purposes for these trials. Instead, healthy tubers were obtained from Grafton and planted in propagation beds on 18th July, 1928. There was, nevertheless, a certain percentage of curly top infection in these beds; indeed, the disease appeared in all the varieties, but to a somewhat lesser extent in White Yam than in the others.

The Variety Trial.

Planting was carried out on 20th December, 1928, in rows 3 feet apart with plants 2 feet apart in the rows. M22 mixture was applied at the rate of 2½ cwt. per acre. At planting time, dry conditions prevailed, and it was therefore necessary to water each plant as it was "dibbled in."

Rainfall during the growing period was as follows:—December, 1928 (20th to 31st), 52 points; January, 1929, 1,561; February, 630; March, 1,465; April, 898; May (1st to 27th), 207; total, 4,813 points.

The vines were watered twice to keep them alive until the dry spell broke on 11th January, 1929, when the vines commenced to grow. Inter-row cultivation was carried out till the vines had spread too much to permit of this operation. Harvesting took place on 27th and 28th May, 1929.

YIELDS in the Variety Trial.

	t.	c.	q.
White Yam	7	7	3
Brooks' Seedling	6	11	0
Pierson	6	3	1
Yellow Strassburg	4	11	2
Nancy Hall	4	10	1
Southern Queen	4		

Yellow Strassburg did not yield up to expectations on this occasion. Nevertheless, Brooks' Seedling, White Yam, and Yellow Strassburg are about the best varieties for this locality; they are good chunky sorts of marketable size and good eating quality, and are also good keepers.

Nancy Hall and *Southern Queen* are both good keepers and market sorts, but seldom yield well here.

For the purpose of making observations on the virus disease, a small area of curly top infested plants was established of the varieties Brooks'

Seedling and Southern Queen. In this area the plants grew, but the leaves were very much curled and the plants did not spread normally. Very few tubers were produced, and what were produced were small ones, and were fed to pigs after being harvested to prevent spread of the disease. Where this disease occurs, a system of propagating only from healthy plants and the destruction of all diseased ones are necessary. No variety here at present can be said to be resistant; the fact that less White Yam plants were infested with the disease than was the case with other varieties does not necessarily indicate that this variety is resistant to it. Further observation will be made during the coming season.

The Manurial Trial.

Planting took place on 19th January, 1929, White Yam being the variety used. The plants were all free from curly top. A satisfactory "strike" resulted and the growth made, considering the lateness of planting, was good. The rainfall was as follows:—January, 1929 (19th to 31st), 1,235 points; February, 630; March, 1,465; April, 898; May, 418; June (1st to 5th), 4; total, 4,650 points.

Before harvesting it was evident, from the swelling of the ground, that better yields would be obtained from the plots manured with P11 and P12 fertiliser mixtures than from the unmanured plot. Curly top did not occur in this trial. Harvesting took place on 5th June, 1929.

RESULTS of the Manurial Trial.

Fertiliser Treatment.	Yield per acre.				Yield per acre (average over two years).			
	t.	c.	q.	lb.	t.	c.	q.	3
P11 mixture (327 lb.)	5	3	0	14	4	1	0	3
P12 mixture (327 lb.)	4	9	3	13	3	11	1	23
M22 mixture (560 lb.)	4	2	2	0	4	2	2	0
Superphosphate (280 lb.)	3	19	2	6	3	9	1	27
P13 mixture (373 lb.)	3	12	0	21	3	2	0	14
No manure (check plot)	2	18	3	20	2	15	1	27

NOTE.—The composition of these different fertiliser mixtures will be found on page 717.

Remarks.

The yields were not high, but must be regarded as satisfactory when the lateness of planting is taken into consideration.

As in the previous year, the complete manure P13 did not give as good results as the other treatments, and this mixture cannot, therefore, be recommended.

On the average of results for the two years, M22 has given the best results. M22 would have undoubtedly produced much heavier yield had planting been carried out earlier. P11 and M22 are both worthy of recommendation.

White Maize Competition, 1928-29.

L. S. HARRISON, Special Agricultural Instructor.

A FIELD competition for white maize, for which Messrs. Kellogg (Australia) Pty. Ltd., of Sydney, donated the prizes, was again conducted during the 1928-29 season. The State was divided into five competition districts in the same manner as for the Royal Agricultural Society's championships, while the crops were also judged on the same point score basis, except that additional points (maximum 15) were awarded according to the suitability of the harvested grain for manufacturing purposes. Conditions governing the competition, scale of points, and other particulars, being the same as for the

The Crop with which Mr. J. M. Lamond Carried off the South Coast Competition can be seen in the Backgroun.

The dairy cows in the foreground suggest one good reason why Mr. Lamond grows maize.

R.A.S. championships, were given when reporting the results of those competitions in last month's *Agricultural Gazette* (see page 645). It will be observed that some competitors secured prizes in both competitions, which is only natural, seeing that the conditions of entry are similar, and the one crop, provided it is a white variety, is eligible for both. Some particularly fine samples were forwarded for determination of points under the heading of "Suitability for Manufacture," Hickory King proving the most popular in this connection.

PRIZE WINNERS IN THE WHITE MAIZE COMPETITION, 1928–29.

		£	s.	d.
No. 1 District—North Coast—				
Carle Bros., Raleigh, Bellinger River, c/o Bellinger River Agricultural Society, Bellingen ...	1st	15	0	0
J. H. Bennett, Fernmount, Bellinger River, c/o Bellinger River Agricultural Society, Bellingen ...	2nd	10	0	0
M. McBaron, Riverview, Raleigh, Bellinger River, c/o Bellinger River Agricultural Society, Bellingen ...	3rd	5	0	0
Total Prize Money ...		£30	0	0
No. 2 District—Lower North Coast—				
Colin Shields, Somerset, Mount George, Upper Manning River, c/o Upper Manning River Agricultural Association, Wingham, Upper Manning River ...	1st	15	0	0
W. E. Ward, Sherwood, Macleay River, c/o Macleay River A.H. & I. Society, Kempsey, Macleay River ...	2nd	10	0	0
S. E. Everingham, Moorland, Lower Manning, c/o Manning River Agricultural Association, Taree, Manning River ...	3rd	5	0	0
Total Prize Money ...		£30	0	0
No. 3 District—South Coast—				
J. M. Lamond, The Willows, Terrara, via Nowra, c/o Shoalhaven Agricultural Association, Nowra ...	1st	15	0	0
J. Bennett, Albion Park, c/o Albion Park A. & H. Society, Albion Park ...	2nd	10	0	0
J. Graham, Barrengarry, Kangaroo Valley, c/o Kangraoo Valley A. & H. Association, Kangaroo Valley ...	3rd	5	0	0
Total Prize Money ...		£30	0	0
No. 4 District—Tumut and Gundagai—				
Brown and Davis, Tumut Plains, c/o Tumut A. & P. Association, Tumut ...	1st	15	0	0
E. E. Vickery, Tumut, c/o Tumut A. & P. Association, Tumut ...	2nd	10	0	0
J. Back, "Gilmore," Tumut, c/o Tumut A. & P. Association, Tumut	3rd	5	0	0
Total Prize Money ...		£30	0	0
No. 5 District—New England—				
G. B. Koch, Steinbrook, Tenterfield, c/o Tenterfield P. A. & H. Society, Tenterfield ...	1st	15	0	0
Sewell Bros., Spring Valley, Tenterfield, c/o Tenterfield P. A. & H. Society, Tenterfield ...	2nd	10	0	0
J. Duff, "Cooredulla," Tenterfield, c/o Tenterfield P. A. & H. Society, Tenterfield ...	3rd	5	0	0
Total Prize Money ...		£30	0	0
Grand Total of Prize Moneys ...		£150	0	0

LARGE SCALE CO-OPERATION IN AMERICA.

Two million farmers are organised into 12,000 associations in the United States for the purpose of marketing their products or buying their supplies, or doing both, on a co-operative basis, according to the United States Department of Agriculture. Last year they sold collectively farm products to the value of nearly £400,000,000, and they purchased farm supplies to the value of about half a million dollars.

Rice-growing Competition, 1928-29.

YANCO IRRIGATION AREA.

H. J. DARGIN, Agricultural Instructor, and G. G. ST. CLAIR POTTS, H.D.A., H.D.D., Land Settlement Inspector.

HEREUNDER are given the results of the Yanco Irrigation Area Rice Crop-growing Competition held under the auspices of the Yanco Area Agricultural Society for the cup presented by the Rice Millers' Association.

Twelve entries were received by the society, but one was withdrawn prior to judging, which was carried out just before harvesting operations commenced. Unfortunately, many growers with excellent crops were not sufficiently conversant with the conditions of the competition, and as a result left their entries until after the closing date, which accounts for the reduction in entries as compared with last season, when eighteen crops were submitted for adjudication. It might be pointed out that the general interest in these competitions is still as great as ever, and it is confidently anticipated that more entries will be received next season, for it is generally acknowledged that healthy rivalry displayed in such competitions helps in the dissemination of knowledge of the correct methods of obtaining the best results in rice culture on the Murrumbidgee Irrigation Areas.

Improved Methods Result in Higher Yields.

The assistance afforded the judges by the competitors was greatly appreciated, and the entrants are to be congratulated on the methods adopted in the cultivation and control and handling of water, such factors being responsible for the good results obtained, not only so far as the yields are concerned, but also in the direction of setting an example for the guidance of many other growers who take an interest in the competition and thereby gain valuable information which undoubtedly reflects upon the industry as a whole. Owing to the more recent and improved methods adopted by growers, greater yields were obtained this season throughout the area than in any other year on record.

Larger check banks and ditches were universally adopted this year, resulting in deeper submergence and better water control, which was largely responsible for the higher average yield obtained throughout the areas.

The variety, Caloro, which was most successful last year in the competition, is practically the only variety grown commercially on the Yanco area, due entirely to the fact that Colusa variety was badly infested with red rice and its variants last season, and the judges noted with satisfaction that the growers acted upon the warning issued in this connection in their report on last year's competition. Furthermore, the absence of red rice was marked throughout the area this season, and consequently second-grade rice was reduced to a minimum. All the entries were grown on land not previously used for rice culture.

The season under review was a normal summer insofar as rainfall was concerned. Cool weather, however, prevailed during the spring, and in consequence germination and early growth were not so rapid as during previous seasons. In point of fact some areas had to be resown owing to the low ground temperatures. The harvesting period was ideal, and dry weather continued throughout, so much so that those settlers who found it necessary to sow late in the season were most fortunate, for, generally speaking, this practice is unsound, and is not recommended.

The necessity for efficient land preparation and careful check-banking, &c., has again been clearly demonstrated by the successful germination, stooling, evenness, and ripening of the crops, together with increased yields when due consideration had been given to the water control aspect. Too much importance cannot be placed upon the question of deeper submergence and the maintenance of a satisfactory water level, both of which play a very important part in the maturing period, filling of the grain, size and extent of the panicles, and standing ability of the crop, and which have a bearing upon the economical handling of the crop and ultimate yield. From observations made by the judges, throughout the growing period deeper submergence seems necessary. In previous years the fields were submerged from 6 to 9 inches, whereas in many instances this past season water was applied to a depth of 12 inches, and in such cases the yields were consistently high.

Do not Drain Too Early.

In most instances the crops were fully matured before draining operations were completed, but several cases were noted where drainage was practised too early, as evidenced by the uneven ripening of the grain, tendency to crack, uneven size, and delayed maturity. Throughout the area there is still a tendency on the part of the growers to hasten harvesting operations by draining too early, but, in effect, this retards the ripening of the grain, and therefore this mistaken idea defeats the object. Care should be taken to ensure ripening of the grain, and thus prevent these defects, by holding the water for an evaporation period of at least eight days after the last few grains situated nearest the plant are in the medium dough condition. Drainage may then be carried out slowly.

Plagues of grasshoppers were prevalent during the early stages of development from the germinating period onwards, and it became necessary to submerge many fields of rice earlier than would otherwise have been the case. Observations made in this connection clearly indicate that rice crops may be submerged without any detrimental effect, providing the seed in the ground has sprouted, and, although this practice is not generally recommended, the experience of the past season shows what might be done in cases of emergency.

Traces of cumbungie (*Typha latifolia*) were found in all crops judged and on old cultivation land barnyard grasses were in evidence, while in every instance the virgin country was clean in this respect. Generally speaking, weed control was satisfactory.

Mr. C. H. Young's winning crop, with an estimated yield of 170 bushels per acre, scored heavily for condition, evenness and appearance of the crop, and apparent yield, while Mr. A. D. Mackellar's crop, only one point behind for second place, with an estimated yield of 175 bushels per acre, scored more points for preparation of the land, including seed-bed, facilities for irrigation control and drainage, and also in apparent yield, but lost points for condition and evenness and appearance of the crop, which were unfortunately brought about by the uneven texture of the soil. The presence of cumbungie was also responsible for points being lost. It is interesting to note that both these heavy-yielding crops were grown in water standing 12 inches deep.

Mr. Young is to be congratulated on winning this cup two years in succession, and Mr. Mackellar for his very fine effort and particular attention to cultural details on crab-holey country, which is so uneven in texture and hence difficult on which to produce an even first crop.

From the results obtained this season it would appear that there is no necessity to alter the rate of seeding previously recommended, viz., 90 to 100 lb. per acre for virgin rice land. The importance of growers obtaining pure seed from recommended crops cannot be too strongly emphasised.

RESULTS of Yanco Rice Growing Competition, 1928–29.

Competitor.	Rate of sowing per acre.	Preparation of land including seed bed. Facilities for drainage and irrigation control.	Freedom from weeds (1st crop 24 pts., 2nd crop 26 pts.).	Condition, appearance, and evenness of crop.	Sample sheaf, Annual Leeton Show, 1929.	Apparent yield (1 point for each bushel of apparent yield).	Total.
Maximum points ...	...	50	24	25	10	...	...
	lb.						
C. H. Young, Farm 1448, Murrami	110	47	22	24	10	170	273
A. D. Mackellar, Farm 740, Leeton	110	49	20	18	10	175	272
W. H. Minchin, Farm 387, Leeton	110	47	19	21	Nil	155	242
H. M. Jenkins, Farm 1441, Murrami	100	44	19	22	Nil	155	240
H. B. Rogers-Harrison, Farm 1132, Murrami	105	46	20	20	Nil	150	236
A. D. Malcolm, Farm 1039, Murrami	120	44	15	20	10	135	224
L. Jamieson, Farm 479, Stony Point	110	44	18	21	Nil	140	223
H. S. Clark, Farm 159, Stony Point	100	45	14	20	10	130	219
J. Stewart, Farm 502 Colando	90	41	15	17	Nil	140	213
J. S. Dooley, Farm 370, Leeton	100	44	16	18	Nil	135	213
Messrs. Glenn and Moller, Farm 977, Murrami ...	100	38	18	18	Nil	125	199
G. H. Blencowe, Farm 291, Leeton	...	...	(Entry withdrawn)				

Note.—Caloro variety was grown in every case.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney, not later than the 12th of the month.

Maize—

Fitzroy ... Manager, Experiment Farm, Grafton.
Leaming ... Manager, Experiment Farm, Grafton.

Sorghum—

Collier ... Under Secretary, Dept. of Agriculture, Box 36A, G.P.O., Sydney.
Feterita ... Manager, Experiment Farm, Coonamble.
Under Secretary, Dept. of Agriculture, Box 36A, G.P.O., Sydney.
Saccaline ... Under Secretary, Dept. of Agriculture, Box 36A, G.P.O., Sydney.
Mr. A. S. Pankhurst, William Street, Singleton.
Sumac ... Manager, Experiment Farm, Bathurst.
Under Secretary, Dept. of Agriculture, Box 36A, G.P.O., Sydney.
White African Under Secretary, Dept. of Agriculture, Box 36A, G.P.O., Sydney.
Principal, Hawkesbury Agricultural College, Richmond.

Broom Millet—

Manager, Experiment Farm, Coonamble.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

The Wattle Bark Industry in South Africa.

Wattle bark is by far the most important of the minor forest industries of the South African Union. It is a well-established one, and promises to have a future of continued expansion and prosperity. The industry has been developed by private enterprise, notably in Natal, where the greater proportion of the approximate total of 310,000 acres of wattle plantations is situated.

In 1927, South Africa exported 105,284 tons of wattle bark valued at £868,000, and 17,361 tons of bark extract having a value of £291,000.

Australia's imports of wattle bark and extract from South Africa for the five-year period from 1923 to 1927 averaged in value about £34,000 per annum.

Summer Fodder Crops.

The Effect on the Yields of Subsequent Wheat Crops.

B. M. ARTHUR, H.D.A., Senior Agricultural Instructor.

THIS trial, which was commenced during the 1925-26 season on Mrs. J. Berney's property, Kildara, Eurimbla, via Cumnock, to test the effect of summer fodders grown for grazing or silage purposes on the yields of wheat crops sown on the same land in the autumn immediately following, was continued for a third year. (See *Agricultural Gazette,* April, 1927, and May, 1928, for results of the previous years' trials.)

An area of approximately 15 acres of rich chocolate self-mulching loam of limestone origin was selected. Wheat had been grown on it during 1926, and the stubble was burnt off just prior to mouldboard ploughing (4 inches deep) in August, 1927. It was then harrowed after rain in late September, and 4-acre plots of Sudan grass, Japanese millet, and maize (Funk's Yellow Dent) were sown on 13th October. The maize was sown at the rate of 7 lb. and the other two crops at 10 lb. seed per acre, 40 lb. superphosphate being mixed with the seed in each case. An area of 3 acres was left in the centre as a bare fallow, and this was springtoothed late in October.

Germination of Sudan grass was patchy, but in the case of millet and maize it was good. On 13th January, 1928, portion of each plot was cut green for silage, and weighed on the 14th idem when the following yields per acre were obtained:—

	t.	c.	q.	lb.
Sudan grass	1	9	3	8
Japanese millet	1	13	1	9
Maize	3	2	0	11

The total quantity of greenstuff produced filled a small silage pit 60 feet by 9 feet by 4 feet, equal to 80 cubic yards, or 40 tons.

Plots were again fed off at a later date by sheep on two occasions. Preference was shown for the millet, but the Sudan grass gave the best feeding results.

The rainfall during the growing period of summer crops totalled 1,719 points, and on bare fallow, from August, 1927, to May, 1928, totalled 2,571 points.

All the plots were scarified early in March after the removal of cornstalks, &c., and again in mid-May. Wandilla wheat was sown on 26th May at the rate of 60 lb. seed and 70 lb. superphosphate per acre over the whole area. The effective rainfall on the growing wheat was 705 points.

WHEAT Yields following Summer Fodders.

	Season 1923 (variety Waratah).		Season 1927 (variety Bena.)		Season 1928 (variety Wandilla).		Total yield for three years.	
	Yield per acre.		Yield per acre.		Yield per acre.		Yield per acre	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Wheat after Japanese millet... ...	15	39	16	8	22	8	53	55
Wheat a ter Sudan grass	20	33	18	14	21	26	60	13
Wheat on bare fallow	23	29	17	42	22	25	63	36

The results for 1928 do not vary very greatly from those obtained in 1926 and 1927, except that wheat, after Japanese millet, has given comparatively better returns this last year. The aggregate yields for three years show a difference of 3¼ and 9¾ bushels in favour of bare fallow as compared with Sudan grass and Japanese millet, respectively, which, at 5s. per bushel, represent monetary losses in wheat returns of 16s. 3d. and 48s. 9d. per acre.

While the results of the trial extending over a period of three years show that the growing of summer fodders on a fallow prior to the sowing of the wheat or main profit crop has a retarding effect on subsequent wheat yields, the amount of grazing or greenstuff for silage purposes, which is obtained from the sowing of quick growing summer fodders such as Sudan grass or Japanese millet, in average seasons, more than compensates landowners for the apparent monetary losses previously quoted, particularly in view of fluctuating wheat prices, and the greater attention being paid to the production of fat lambs, &c.

The question as to whether a system such as this would tend to encourage weed growth and the spread of diseases has not been considered.

QUEEN BEES AND NUCLEI COLONIES FOR SALE.

IN the advertising pages of this issue beekeepers will find particulars concerning prices, &c., of nuclei colonies and queen bees, which are available at Hawkesbury Agricultural College and Wauchope Government Apiary. The prices are the same as those charged last season, and beekeepers starting out in the industry would be well advised to ensure that the first step they take will not have to be retraced. This they can be certain of by purchasing reliable colonies and queens. On the other hand, those already established can add to the vigour and health of their colonies by introducing pure-bred Italian queens.

The nuclei colonies offered for sale are established on three Hoffman or four Bolton frames, and can be supplied either with tested or untested queen in company.

As Wauchope Apiary will be carrying out important selection and breeding work during the early part of the season, only a limited number of queen bees will be available from that institution until late in November. Hawkesbury Agricultural College, however, is in a position to supply all orders in full.

Sorghum-Sudan Grass Hybrids.

(1) Stock Poisoning due to Their Presence in Sudan Grass.

A. W. S. MOODIE, H.D.A., H.D.D., Assistant Agrostologist.

DURING the past few seasons large areas of Sudan grass have been sown in the wheat districts of New South Wales. Under normal circumstances this crop is one of the most valuable for summer grazing and for hay and silage, proving particularly useful in years when the wheat crops fail. Occasionally, however, cases of stock poisoning are reported in which the trouble is attributed to Sudan grass, and the prominence given in the press to these reports has resulted in many farmers and graziers being unwilling to make use of this crop.

Where cases of poisoning have been investigated it has usually been found that a number of sorghum-Sudan hybrids or pure sorghums were present in the crop, and these were held responsible for any losses of stock that had occurred. It is well known that sorghum should be allowed to flower before being fed to stock, whereas pure Sudan grass can be fed at any stage of growth. It was therefore concluded, and field observations have confirmed the opinion, that hybrids produced by accidental inter-pollination were likely to prove as toxic during their early stages of growth as young sorghum plants.

With a view to obtaining definite information on the toxicity of sorghum-Sudan hybrids work was commenced during the 1927-28 season to breed a number of these hybrids. Sudan grass was selected as the female parent and Saccaline sorghum as the male, this variety of sorghum being the most common in some districts where Sudan grass seed is harvested. The glass plate method of collecting and transferring the pollen from the sorghum to the previously prepared Sudan grass flowers was used and proved very satisfactory. The treated flowers were then bagged. The hybrid seeds produced were harvested during May, 1928. During the spring of 1928 a sowing of these seeds was carried out, and it was found that the seeds germinated freely, although a number appeared malformed and likely to be of little value.

Hybrid Plants Easily Detected.

During the growing period close observations and measurements were made in the hope that the information obtained would be of value to pastoralists in detecting and removing sorghum-Sudan hybrid plants before grazing commenced. It was found that, at 9 inches to 12 inches high, the stage at which grazing usually commences, little difficulty was experienced in detecting the hybrid plants. In every case the hybrid seed produced a plant resembling the male parent (Saccaline sorghum). At the stage indicated the hybrids could be readily picked out by the thick stems,

broad leaves, and profuse stooling. The measurements taken reveal the fact that the hybrids were in every way intermediate between the two parents. At flowering time the seed heads resembled Sudan grass inasmuch as they were loose and spreading, but were considerably larger than Sudan grass and carried more flowers.

At 12 inches to 18 inches high the plants were tested for hydrocyanic acid content, and the results are given by Mr. A. A. Ramsay, Chief Chemist, in the second half of this article.

The Seed-testing Aspect.

Every year prior to the planting season for Sudan grass, the Seed Testing Laboratory of the Agrostologist's Branch is called upon to examine many samples and report on the presence of sorghum or sorghum-Sudan

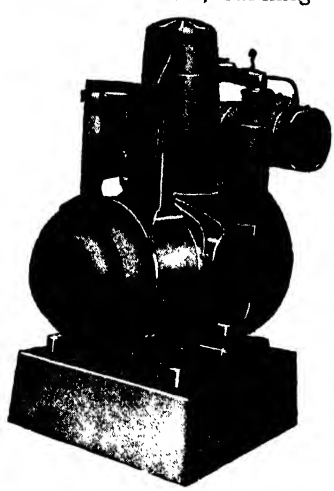
Young Sorghum-Sudan Grass Hybrids, F1 Generation.

hybrid seeds. Seeds which are considered to be hybrids are afterwards grown, and in the majority of cases the seed analyst's determinations are found to be correct.

The creation of these "artificial" hybrids also affords confirmatory evidence of the methods employed. The seeds obtained from the first cross proved to be shorter and rounder than Sudan grass, resembling the smaller seeds that would be found in a sample of Saccaline sorghum. The seeds produced by the F_1 generation were considerably larger in size, but in general appearance, resembled the above.

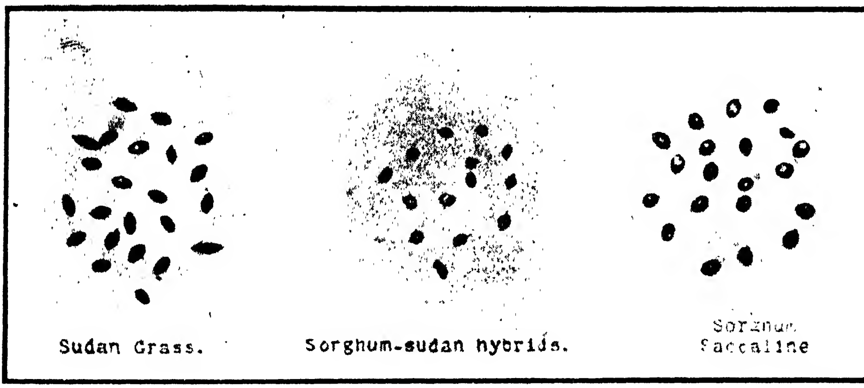
Purchase Reliable Seed.

Although Sudan grass is largely grown in the wheat belt, a great deal of the seed produced is harvested in districts where sorghums are also grown.



This applies also to Sudan grass seed from other States. Sorghum and Sudan grass are closely related, and if grown in close proximity a good deal of natural cross-pollination is likely to take place, resulting in the production of a sample of Sudan grass seed, the crop from which is likely to prove injurious. Farmers and graziers should, therefore, take every care in purchasing Sudan grass seed to obtain tested samples free from these injurious hybrids. Where such a sample is obtained and proves to be pure, seed should be harvested from that crop, thus insuring a supply of pure seed for the future.

Farmers should be particularly careful regarding the much-advertised strains of imported Sudan grass seed, as some of the worst samples of Sudan grass seed examined in our Seed Laboratory have come from overseas, containing not only sorghum-Sudan hybrid seeds, but pure sorghum seeds in large numbers.



Showing the Difference in the Seeds.

Sorghum Safe After Reaching Flowering Stage.

As a result of the reports appearing in the agricultural press from time to time on the question of sorghum poisoning, many farmers are in doubt as to the wisdom of utilising sorghum in any form. Local and overseas investigations, however, have shown that:—

(1) Sorghum is quite safe when it reaches the flowering stage.

(2) There is danger from poisoning, especially in the case of large stock, from young growth or "second growth" coming away after the main crop has been harvested.

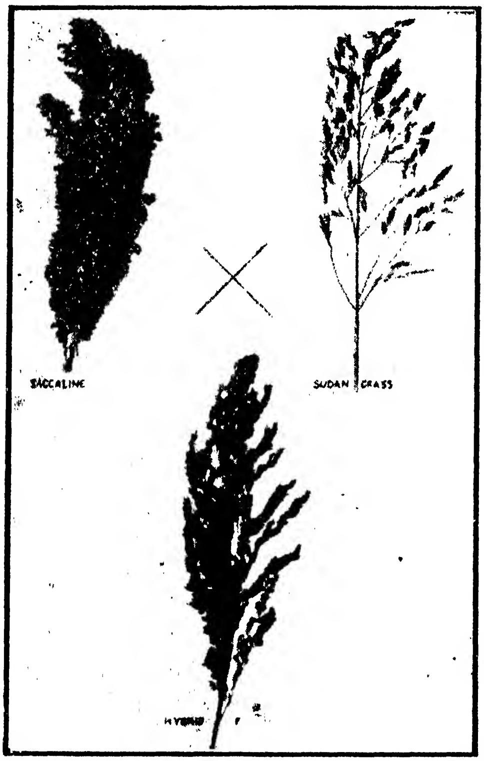
(3) Young growth that is frosted, or stunted growth caused by drought conditions, is often highly toxic.

(4) Cutting the immature crop and allowing it to wilt for at least twenty-four hours before feeding is often effective in rendering the material harmless, but sometimes mortality will occur even when this precaution has been taken.

It appears that the above statements will also apply to sorghum-Sudan hybrids, and where these appear in the Sudan grass crop particular care should be taken. If it is possible the hybrids should be removed as soon as they are old enough to be recognised (9 to 12 inches high). If the hybrids are too numerous to be removed, to avoid all possibility of poisoning the crop should be allowed to flower before being utilised.

Summary.

Pure Sudan grass is perfectly safe to feed to stock at any stage of growth.



Avoid Harvesting Seed from Sudan Grass Crops Producing Heads similar to the one labelled "Hybrid F1."

Sorghum should be allowed to reach the flowering stage before being grazed or fed to stock.

Hybrids, the progeny resulting from the crossing of Sudan grass and sorghum may contain much more hydrocyanic acid than sorghum.

Sorghum-Sudan hybrid seeds can be fairly accurately detected in a sample of Sudan grass seed.

Sorghum-Sudan hybrid plants are easily detected in the field and should be removed before grazing commences.

Sudan grass seed should not be harvested from crops in which sorghum-Sudan hybrids have appeared.

Farmers are urged to have Sudan grass seed examined in the Departmental Seed Laboratory for the presence of hybrids before purchase, and to harvest seed for their own use from crops free from the presence of hybrids.

(2) Hydrocyanic Acid Content of Sorghum-Sudan Hybrids.

A. A. RAMSAY, F.C.S., F.A.I.C., Chief Chemist.

A NUMBER of the hybrid plants raised by Mr. A. W. S. Moodie, who used Saccaline sorghum as the male and Sudan grass as the female parent, were examined in the chemical laboratory with the results shown in the following table:—

No. of hybrid.	Particulars of seed from which the plant was raised.	Height of Plant when cut.	Content of Hydrocyanic Acid.	Hydrocyanic Acid expressed as "grains" per pound.	Quantity containing minimum fatal dose for sheep.
		feet.	per cent.		lb.
1	Plump	4*	0·0030	0·210	4·41
2	,, ...	4	·0110	·770	1·20
3	,, ...	18	·0004	·028	33·15
4	,, ...	18	·0090	·630	1·47
5	,, ...	18	·0001	·007	133·33
6	,, ...	12	·0100	·700	1·32
7	Shrivelled	12	·0100	·700	1·32
8	,, ...	12	·0100	·700	1·32
9	,, ...	18	Nil	Nil	......
Pure Sudan grass		......	0·00001	·0007	1333·33
Pure Saccaline		12	0·00300	·210	4·41

* Not in flower.

It will be noted that the hybrids contain greatly varying amounts of hydrocyanic acid, ranging from nil in No. 9 to .01 per cent. in Nos. 2, 6, 7, 8.

The figures above appear to indicate that it is possible that the crossing of sorghum with Sudan grass may give rise to progeny containing much more hydrocyanic acid (three times as much) than in the sorghum parent. In the above trials 66.7 per cent. of the samples contain as much or more hydrocyanic acid than the male parent (sorghum), while 33.3 per cent. contain less; *i.e.*, at the stages of growth of the samples when submitted for examination.

The analytical data also indicate the potential danger of the presence of such hybrids in connection with the feeding of stock.

The analytical work was carried out by Mr. E. Griffiths, B.Sc.

Farm Forestry.

V. The Native and Introduced Trees of New South Wales.

[Continued from page 243.]

R. H. ANDERSON, B.Sc. Agr., Assistant Botanist, Botanic Gardens, Sydney, and Lecturer in Forestry, University of Sydney.

THE TABLELAND DIVISION.

The Tableland Division is physiographically a fairly well defined one and contains a distinctive tree flora. On the west it is bounded by the Western Slopes divisional line referred to in a previous article. The eastern boundary line consists of a contour line varying roughly from 2,000 feet in the south to 3,000 feet in the north. In the basin of the Hunter River there is a break in the continuity of the division, the comparatively low-lying intervening country being included in either the Western Slopes or Coastal Divisions.

The Tableland Division may conveniently be divided into three subdivisions, viz., northern, central, and southern, and, owing to the diversity of conditions in these, a further subdivision into districts is desirable.

Southern Subdivision.

The southern subdivision extends from the Victorian border to a northern boundary line passing through Marulan, Taralga, and a little to the north of Binda. Physiographically it consists of a central plateau, which is bounded on both east and west by ranges of mountains, and can accordingly be divided into the following districts:—

(1) *Western Mountains.*—These include the Snowy Mountains, Muniong Ranges and higher mountains of the Commonwealth Territory. Kiandra, Tumbarumba, and Laurel Hill are representative towns of this district Falls of snow are common during winter months, and the average annual rainfall is fairly heavy, varying from 39 inches at Tumbarumba to 64 inches at Kiandra. The limit of tree life is reached on Mount Kosciusko at a little over 6,000 feet.

(2) *Eastern Mountains.*—A fairly large proportion of this district is very sparsely settled, and consists mainly of forest areas. It passes more or less imperceptibly into the ranges of the Coastal Division.

(3) *Monaro.*—This is represented by the southern portion of the central plateau lying between the eastern and western mountains, and includes some very bleak country in which conditions are not very favourable for tree development, the adverse conditions of cold and low rainfall being combined to a large extent. The average annual rainfall varies from 19 inches at Cooma to 29 inches at Adaminaby.

(4) *Canberra-Goulburn District.*—Although the average annual rainfall is fairly low in this district, varying from 22 inches at Canberra to 25 inches at Goulburn, conditions are moderately favourable for tree growth, especially for selected species.

Both in the Monaro and Canberra-Goulburn districts there are fairly extensive treeless areas in addition to sparsely timbered parts. Several theories are advanced to account for the failure of tree life to establish itself naturally on these areas. In the majority of cases the soil is basaltic, tree life being limited to the more siliceous types. Such basaltic soils are often heavy, impervious, and badly aerated, and are, therefore, unfavourable for average tree growth.

In the Coastal Division basaltic soils support a heavy growth of brush species, but, owing to the adverse climatic conditions of combined cold and low rainfall, such species are unable to establish themselves under Tableland conditions.

Some, at least, of the treeless areas on the Tablelands have only comparatively recently emerged from a waterlogged condition, and it has been suggested that the majority of treeless areas represent the sites of old lakes or marshes on to which trees have not yet had time to spread naturally.

Although some of the treeless districts present many difficulties for tree-planting work, other districts, notably in the vicinity of Canberra, have

A Typical Treeless Area on the Southern Tablelands.

demonstrated their ability to support good tree development. Tree-planting work with a number of species has met with encouraging success, and it can be assumed that a naturally treeless condition is no sure indication of the unsuitability of the area for tree life, especially if some care is exercised in the choice of species.

Central Subdivision.

The central subdivision extends from the boundary line of the southern subdivision to the southern border of the Hunter River basin. It may be divided into the following districts:—

(1) *Moss Vale-Mittagong District.*—Conditions in this district are fairly cold during the winter months, and heavy frosts are common, but a number of coastal tree species make their way up the more sheltered valleys. The average annual rainfall varies between 35 and 40 inches. Soils are mainly of sandstone origin, but there are some areas of shale and basalt.

(2) *Blue Mountains.*—In this district the average annual rainfall varies from 34 inches at Lithgow to 55 inches at Katoomba, and soils are chiefly from sandstone, and carry a typically sandstone flora. There are, however, a

few basalt areas, notably at Mount Wilson, on which some of the more hardy of the coastal brush species are found, and which represent small areas of "brush" or "rain" forest. In such places the rainfall is heavy, being in the neighbourhood of 50 inches.

(3) *Orange-Bathurst-Carcoar District.*—This district consists of undulating to hilly country, with an average annual rainfall varying from 24 inches at Bathurst to 35 inches at Orange. Both granitic and basaltic soils are present, varying from light sandy loams to stiff clays, with alluvial soils in the valleys and stony, shingly hills and ridges. The tree flora exhibits an infusion of Western Slopes species.

Northern Subdivision.

The northern subdivision extends from the northern border of the Hunter River basin to the Queensland border, and might also be be made to include the outlying Liverpool and Nandewar ranges. It may be divided into two districts, viz.:—

(1) The main plateau comprising the greater portion of the subdivision. In this district the rainfall varies from 32 inches at Glen Innes at 36 inches at Guyra.

(2) The mountain slopes on the eastern side. In this district the average annual rainfall is much heavier, reaching as much as 55 inches at Guy Fawkes. Conditions, too, are generally more temperate, frosts, &c., being less severe owing to the coastal and easterly influence.

Soils in the northern subdivision are mainly from granite, although large stretches of basalt occur, as well as slates and schists. The granites are very variable. The "tin" granites form the most acid type, and yield a poor sandy soil. Other granites, including the "blue granite," provide moderately good soils.

General Features of the Division.

The native tree flora of the Tableland Division is a fairly distinctive one, although typical species of the Western Slopes Division ascend in parts to intermingle with true tableland species. On the eastern side some of the coastal species intrude into the division, making their way up gorges and valleys which shelter them from cold and drying westerly winds.

Within the division a number of species, such as the Snow Gum (*Eucalyptus coriacea*), have a very wide range, extending from north to south, but some species, such as *Eucalyptus de Beuzevillei,* have a very limited distribution, being found in only one or two localities.

Each subdivision has a moderately distinctive flora, although possessing many species in common with each other. Valuable building and general hardwood timbers are furnished by a number of species, and a few species, notably *Eucalyptus gigantea*, *Eucalyptus fraxinoides*, and *Eucalyptus regnans*, supply a moderately light, tough timber which is very useful for a number of purposes, including joinery work, house building, and case-making.

In some districts the naturally occurring tree growth is distinctly unsatisfactory from the point of view of shade and shelter for stock, and although

the usefulness of such trees might be improved by judicious lopping or coppicing, in many cases replanting with more suitable species, such as Pines or other Eucalypts, would be more profitable.

In this division the cold country species of Europe and America reach their best development, and make beautiful ornamental studies, apart from their general usefulness.

The principal tree needs of the division are for windbreaks, shelter belts, and shade trees for stock, &c. Some districts, notably on the Monaro, are among the coldest and most bleak in the State, and the greater part of the division is subject to high, cold winds, making some sort of shelter a pressing necessity. Of the forty-eight questionnaires returned from this division, all were of the opinion that windbreaks and shelter belts are of especial importance in their particular district.

Good Natural Regeneration of Eucalypts on the Northern Tablelands.

Tree-planting work is essential in the more closely settled districts, where the native tree growth has been more or less completely cut out, on naturally treeless areas, and where the existing eucalyptus species make unsatisfactory development. In some districts a fair amount of planting has been carried out, especially with belts of *Pinus insignis*, a species which appears to be very suitable for the division.

The supply of wood for fuel is, generally speaking, abundant, but in some districts, chiefly in the neighbourhood of towns or on treeless areas, stocks have been exhausted, and fresh supplies involve long haulage. In other parts firewood supplies are coming mainly from sapling growth, indicating partial exhaustion and impending failure. Good timber, both for building

and fencing, is scarce in many parts, due to the poor quality of local trees, and the gradual cutting out of the more suitable species. In such cases the planting of useful species would be of decided advantage. In fruit-growing districts the cultivation of trees which yield good case timber should be profitable. Conditions for tree growth are, in the main, fairly satisfactory, and the range of suitable species moderately wide.

On the colder, bleaker portions, especially where the rainfall is low, and on some of the basalt areas, tree-planting work is more or less problematical, and the number of suitable species very limited.

The Native Trees of the Tableland Division.

The various species of eucalyptus, known locally as boxes, stringybarks, gums, bloodwoods, ashes, peppermints, ironbarks, messmate, &c., form by far the largest proportion of the tree flora of this division, and include a wide range of appearance and utility. The species are grouped together under the popular names in the following notes.

GUMS.

The bark in all so-called species is smooth all over, although a little rough bark is generally present at the butt, extending for various lengths up the trunk. In some cases, as, for example, the term "White gum," the popular name is applied to a number of quite distinct species, and for accurate identification the botanical name must be referred to.

Snow Gum or White Sally (*Eucalyptus coriacea*).
(Also known as White Gum, Cabbage Gum, Cattle Gum.)

A small to medium-sized tree with a wide range throughout the Tableland Division, especially at higher elevations, and marks the limit of tree life at Mount Kosciusko. It is found on a variety of soils, but appears to have a preference for those of basaltic origin.

Uses.—The foliage is coarse, rather shiny, and is eaten by cattle to some extent, providing fair fodder. The timber is pale-coloured, gum-veined, and inclined to warp badly, being little used for milling. It is, however, fairly largely used for fencing material, and appears to be durable. It makes good fuel, burning well even in the green state. The tree is a moderately good cattle shelter.

Black Sally (*Eucalyptus stellulata*).
(Also known as Sally or Muzzlewood.)

A small to medium-sized tree with a fairly dense, spreading crown, occurring in all the subdivisions. It is usually found on damp flats or near water-courses, especially in rather open country of fairly high elevation. It shows, if anything, a preference for basaltic soils. The bark is smooth, except for a certain amount of dark, rough bark at the butt, and is generally a characteristic greenish or slate colour.

Uses.—The timber is pale-coloured, gum-veined, and warps badly, and is not considered to be durable, although used somewhat for fencing posts, especially in wet ground. It provides good fuel. Its principal use is as a small shelter tree, or for fuel on cold wet soils.

SMOOTH-BARKED MOUNTAIN ASH (*Eucalyptus altior*).

A medium to large-sized tree with a smooth, whitish bark, found in the Blue Mountain district of the central subdivision. It reaches its best development in gullies or moderately deep, moist, sandy soil, but is also found to some extent on slopes and ridges.

Uses.—The timber is whitish-coloured, fissile, light in weight, but strong, and is valuable for any purpose requiring a strong, moderately light timber. It can hardly be classed as a useful farmer's tree, but is more a subject for

Snow Gum (*Eucalyptus coriacea*) Approaching the Limit of Tree Growth on the Snowy River.

exploitation by commercial forestry work. It reproduces itself abundantly from seed, but is said to be rather weak in coppicing.

WHITE MOUNTAIN ASH. (*Eucalyptus fraxinoides*).

A large tree with a long clean bole, found chiefly on the eastern edge of the southern subdivision, and to some extent in the Moss Vale-Bowral district of the central subdivision, on moderately deep soils.

Uses.—The timber is whitish, light, and strong, and is valuable for building purposes, tool handles, and as a bending timber. It is used to some extent for fruit cases.

Candle Bark (*Eucalyptus rubida*).

(Also known as Ribbon Gum, Manna Gum, and, occasionally, Spotted Gum.)

A small to large-sized tree with a white, smooth, ribbony bark, found in all three subdivisions, on rather moist soils on elevated land. It is often on slate or igneous soils, and is not usually found on very rocky situations. In the northern subdivision, especially, it forms a large, rather striking tree, with a good straight stem.

Uses.—The timber is not regarded as first-class, but is a moderately useful second-class one. A fairly good shelter tree for farms in colder parts.

Manna Gum (*Eucalyptus viminalis*).

(Also known as White Gum and Ribbony Gum.)

This species resembles the preceding one, *E. rubida,* in general appearance, and is frequently confused with it. It, however, is rather more spreading and pendulous in habit, and keeps to the valleys more closely, although also mingling with *E. rubida* on elevated land. The sucker leaves of *E. viminalis* are, however, very different from those of *E. rubida*. In the former they are generally narrow, whereas in the latter they are nearly round.

Tall Trees of Manna Gum (*Eucalyptus viminalis.*)

E. viminalis is one of the best known and most widely spread of the "White Gums," being found in all three subdivisions. It appears to have a preference for basaltic soils, but also occurs on other types with the exception of poorer sandy ones. On deep soils in valleys it forms a rather striking tall tree with a long straight stem, but on shallow soils it becomes rather poor shaped and branchy. It is one of the trees from which manna is collected.

Uses.—The timber is regarded as being distinctly inferior, warping and cracking badly, and is not durable. It is moderately useful as a shade or shelter tree.

BROAD-LEAVED RIBBON GUM (*Eucalyptus Dalrympleana*).

(Also known as White Gum or Mountain Gum.)

A fairly large tree, reaching 150 feet on deep soils, found in cool ranges of the southern and central subdivisions, and very plentiful in portions of the former. It prefers a fairly deep soil and a good rainfall. In early spring the bark is quite white, but it gradually becomes reddish and rather blotchy. The upper bark peels off in long streamers.

Uses.—It provides a good, pale-coloured timber, which combines strength and lightness, and may be used for indoor work such as flooring, and tool handles and fruit cases. It is said to be subject to white ants, and accordingly is not so much in favour for building purposes.

RIVER WHITE GUM (*Eucalyptus numerosa*).

(Also known as White Top, and occasionally as Peppermint.)

A medium-sized tree, found in the eastern valleys of the central subdivision, and extending to the Coastal Division. It usually inhabits the sides of gullies or the steep banks of rivers, and is generally in the vicinity of watercourses. The foliage is somewhat sparse and drooping, and the fruiting capsules are produced in great abundance.

Uses.—The timber is fissile, pale-coloured, easily worked, but not durable. It has been suggested as a good species for the rapid production of casing material. It is an attractive tree, well worthy of cultivation for ornamental purposes.

SILVER TOP (*Eucalyptus nitens*).

(Also known as Giant Gum, White Gum, and Shining Gum.)

A large tree, found mainly in the moist eastern ranges of the southern subdivision, and occasionally exceeding 150 feet in height. The bark is smooth, shiny, and frequently ribbony. The timber is pinkish when first cut, but dries white, is straight-grained, and moderately heavy.

Uses.—Its uses have not yet been thoroughly demonstrated, but it would appear to be a fairly valuable timber species.

SMITH'S GUM OR GULLY ASH (*Eucalyptus Smithii*).

A medium to large-sized tree found on the eastern edges of the southern subdivision, and in the Moss Vale-Mittagong district on soil of volcanic origin. The bark of older trees is often deeply furrowed, resembling something between a stringybark and an ironbark, but the upper trunk and branches are smooth.

Uses.—The timber is pale brown, close grained, hard and heavy, and said to be durable for various purposes. The oil from the leaves is distilled commercially.

A MOUNTAIN GUM (*Eucalyptus goniocalyx*).

(Also known as White, Silver Top, Spotted Gum and Monkey Gum.)

A medium to large-sized tree which ascends from the Coastal Division into the eastern portion of the southern and central subdivisions. It is usually found in gullies on moderately good and deep soil, but will grow on poorer types.

Uses.—The timber varies in colour from pale yellowish to a greyish brown, and is strong and fairly durable. It can be classed as a good second-class timber for building purposes, and is said to be fairly useful for fencing posts.

SCRIBBLY GUM (*Eucalyptus micrantha*).

(Also known as Brittle Gum, Snappy Gum, Brittle Jack, Red Cabbage Gum, and White Gum.)

A small to medium-sized tree with spreading, somewhat drooping branches, found in the central subdivision and in a few localities of the southern subdivision on rather poor sandy soils, especially those from Hawkesbury sandstone. It is usually much branched, with only a short length of stem.

Uses.—The timber is pale red, and in parts of the division is often in request for fencing posts, being fairly durable in the ground. It makes a moderately good fuel. The blue and white patchy trunk and branches and the semi-glaucous leaves are rather picturesque, making it a subject for ornamental planting on poor sandy soils.

SMALL SPOTTED GUM (*Eucalyptus maculosa*).

(Also known as White Gum and Cabbage Gum.)

A small tree with a rather dense head, but occasionally reaching a height of 60 feet. It is found in the southern and central subdivisions, usually on poor shallow soils on slopes and ridges, although sometimes by streams. It is frequently associated with *Eucalyptus micrantha.*

Uses.—The timber is of moderate quality, and is used fairly largely in the districts in which it grows for fencing and general purposes. It is not, however, regarded in any way as a commercial timber.

EURABBIE (*Eucalyptus bicostata*).

A medium to large tree found in the southern subdivision and in one or two localities in the central subdivision, usually in cool, moist sites on moderately good loamy soils. It is closely allied, botanically, to the common Tasmanian Blue Gum (*Eucalyptus globulus*).

Uses.—The pale-coloured timber is regarded as useful for general hardwood purposes, and is said to make an excellent fuel. The tree is also fairly suitable for ornamental and shelter purposes.

DEAN'S GUM (*Eucalyptus Deanei*).

(Also known as Brown Gum and Blue Gum.)

A medium to large tree of fairly spreading habit, occurring both in the Coastal and Tableland Divisions. In the latter it is most common along the eastern portion of the northern subdivision on granite soils, but extends towards the western side in several places, and is also found in a few localities in the central subdivision. The more exposed conditions of the

Tablelands frequently result in a decreased size, and in the formation of a brownish, more or less flaky, bark, giving rise to the common name of "Brown gum."

Uses.—The pale brown or reddish timber is commonly used for building purposes, &c., on the Northern Tablelands, although not highly regarded on coastal areas, where it competes with better class timbers.

CABBAGE GUM (*Eucalyptus amplifolia*).

(Also known as Swamp Gum, Red Gum, Blue Gum.)

A small to medium-sized tree, usually found on swampy flats or on sites with subterranean water at no great depth. It occurs in the northern portion of the southern subdivision, a number of localities in the central subdivision, and is not uncommon on cold moist flats in the northern subdivision.

Uses.—The timber is usually regarded as inferior, although classed by some to be fairly useful for fencing posts.

PINK SWAMP GUM (*Eucalyptus ovata*).

(Also known as White Gum, Red Gum, Blue Gum, Grey Gum.)

A small to medium-sized tree, fairly widely distributed in the southern and portion of the central subdivision. It generally grows on cold, damp, undrained lands or flats subject to periodical waterlogging.

Uses.—The timber is regarded as inferior, although thought to be moderately useful for fencing posts, &c., in damp soils. However, it is a tree which grows on land which is unfavourable for the development of most species.

BROAD-LEAVED SALLY (*Eucalyptus camphora*).

(Also known as Swamp Gum.)

A small to medium-sized tree of rather crooked growth, found along the banks of creeks and on damp flats in the southern subdivision and one or two localities in the central tablelands. The bark at the butt for a distance of 6 feet or so is usually hard and flaky, the branches being ashy grey or fairly dark coloured.

Uses.—The crown is spreading and shady, making it useful as a shade and shelter tree and for ornamental purposes. The timber is regarded as being of little value, except possible as posts for damp places.

BANCROFT'S GUM (*Eucalyptus Bancrofti*).

(Also known as White Gum and Orange Gum.)

A small to medium-sized tree of poor shape, but occasionally forming a fairly large, scrambling tree. It is found mainly in the northern subdivision, but also in one or two localities on the Monaro. It appears to grow both on alluvial, rather damp, flats, and also on poor granitic soils on rocky

hillsides or the tops of ridges. The timber is reddish, brittle, and generally regarded as very inferior. The trees are also often very hollow and defective.

Other smooth-marked eucalypts of the Tableland Division include the following species:—

Eucalyptus de Beuzevillei, a fairly large tree, confined to the Jounama Mountains of the southern subdivision. It is a White gum, having a very pale-coloured timber, somewhat gum veined, and of no particular merit.

Eucalyptus scoparia (a White gum), a small slender tree with narrow, pendulous foliage, found on granite hills near the Queensland border, chiefly in the neighbourhood of Wallangarra. The timber is pale-coloured, fissile, and probably of little value.

Eucalyptus punctata (Grey gum) ascends from the Coastal Division into parts of the central subdivision, but will be dealt with more fully under the Coastal Division.

Eucalyptus haematsoma, a coastal species, is found in several localities in the Blue Mountains.

Eucalyptus Blakelyi (Red gum), a tree of the Western Slopes (under which division it is fully described), makes its way to the warmer parts at lower elevations of the Tableland Division.

PEPPERMINTS.

Species of eucalypts known as peppermints are distinguished by a strong peppermint odour, and have a characteristic, sub-fibrous bark which extends up the trunk and on to the branches to a greater or lesser extent. The upper limbs, however, are generally smooth-barked. This group also includes some species which are popularly known as "Messmate" and "Blackbutt" (of New England).

PEPPERMINT (*Eucalyptus radiata*).
(Also known as Messmate.)

A medium to large-sized tree widely distributed in the central and southern subdivisions, with a peppermint bark on the trunk, the branches being usually smooth and shiny. It grows on a fairly wide range of soils, including the poorer classes, but reaches its best development in the moister forests on fairly deep soils.

Uses.—The timber is pale coloured, moderately light and strong, and somewhat gum-veined, but is useful for buildings, fencing, flooring, and tool handles. It is regarded as fairly durable for fence posts. The foliage is frequently heavy, and well-grown trees provide effective shade and shelter. It responds well to lopping or coppicing, and is fairly ornamental. The foliage also provides a useful oil which is distilled commercially. The species includes two forms or varieties which each yield different oils.

Broad-leaf Peppermint (*Eucalyptus dives.*)

(Also known as Peppermint or Messmate.)

A small to medium-sized tree with a sub-fibrous, greyish bark on thetrunk and sometimes on the larger branches, the upper branches smooth. It is fairly widely distributed in the southern and central subdivisions, and is found in a few localities in the northern subdivision, frequently on rather poor, shallow soils on slate or granite on ridges. It requires, however, moderately moist conditions. It is known almost universally as peppermint, but can be distinguished from other peppermints by its broader sucker leaves.

Uses.—The leaves are very aromatic and are largely distilled for their oil, which is one of the best obtainable for the separation of metallic sulphides by the flotation process in the mining industry. The timber is pale coloured, gum-veined, and not much valued locally. It is used for fuel and rough work, and to a little extent for fencing.

New England Blackbutt (*Eucalyptus Andrewsi*).

(Also known as Peppermint, and occasionally as Messmate or White Top.)

A medium to large-sized tree, widely distributed in the northern subdivision, where it is the principal tree found on the acid granite soils. It reaches its best development on the moist eastern portion, on soils of fair depth, and is often associated with the various stringybarks. It has the typical peppermint bark, with only the ultimate branches smooth.

Uses.—The timber is pale coloured and fissile, but liable to gum veins, and although not first-class, is used a good deal in the districts in which it grows for building and fencing purposes, and is considered to be moderately durable. Some trees, especially if lopped, provide fair shelter.

Black or Red Peppermint (*Eucalyptus nova-anglica*).

A small to medium-sized tree of rather poor shape, fairly commonly found in the northern subdivision. It generally grows on fairly good soils on flats, preferring clayey loams to the heavier basaltic or lighter granitic types. The odour of the foliage is not so strong as that of other "Peppermints."

Uses.—The timber is regarded as of little value, but the tree is frequently left standing on cleared areas for shade and shelter.

Argyle Apple (*Eucalyptus cinerea*).

(Also known as Blue Peppermint, Blue-leaved Apple, and occasionally as Messmate.)

A small to medium-sized tree of picturesque appearance, found in the southern and portions of the central subdivisions, extending as far west as Bathurst. It commonly occurs on rather poor sandy and shaley soils, frequently along watercourses or on flats. It is distinguished by the rather striking bluish-grey or silvery appearance of the leaves.

Uses.—It is a good ornamental and shade tree, and appears to be fairly drought and frost hardy. The reddish-coloured timber is usually regarded as inferior. Oil has been distilled from the leaves fairly extensively on a commercial scale.

SYDNEY PEPPERMINT (*Eucalyptus piperita*).

A small to medium-sized tree, abundantly distributed in the Coastal Division and central tableland subdivision, being practically confined to poor sandstone soils. It is fairly common on the poor rocky sandstone areas of the Blue Mountains.

Uses.—The timber is of poor quality, pale coloured, gum-veined, and warps and cracks badly. Eucalyptus oil was first distilled from this species, but better species are now more commonly employed.

Other species belonging to the Peppermint group include *Eucalyptus Considenіana* and *Eucalyptus vitrea.* The former is known locally as "Yertchuk," "Messmate," "Peppermint," or occasionally as "White Mahogany," and is mainly confined to the lower slopes of the central and southern subdivisions, on rather poor, siliceous soils. The timber is pale coloured, similar to that of *Eucalyptus piperita,* and of little use.

Eucalyptus vitrea (White Top, Messmate, or Silver Top) is a medium-sized tree found in a few localities on both southern and central subdivisions. The timber is gum-veined and of little value .

(*To be Continued.*)

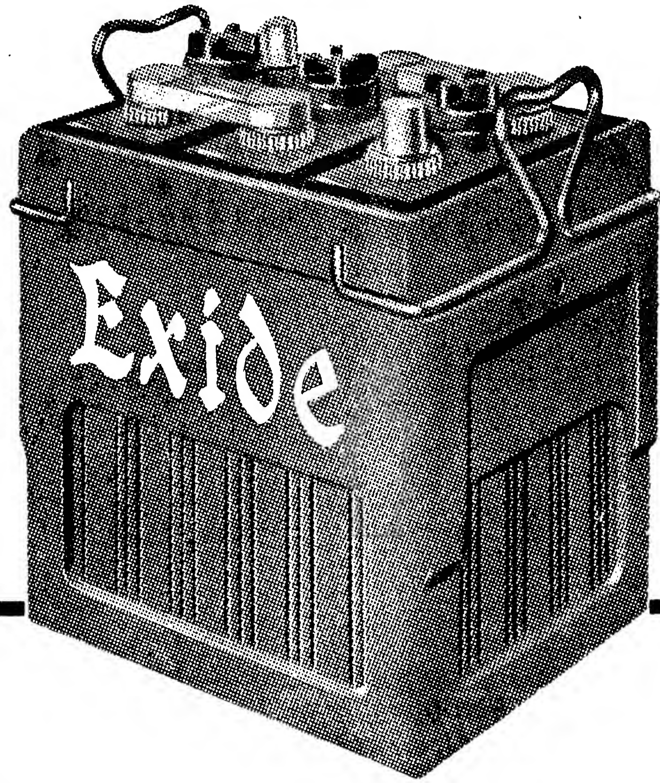
WELLINGROVE SEED MAIZE CONTEST AT GLEN INNES EXPERIMENT FARM.

WELLINGROVE maize has become a very popular variety on the tablelands, and in order to encourage the planting of further areas with this variety the Department is again conducting a Wellingrove seed maize contest at Glen Innes Experiment Farm under the same conditions as that carried out last year. This competition takes the form of a yield test, growers sending along 5 lb. samples of seed, which are sown under uniform conditions and on a selected area at the Experiment Farm. The Department's certificate will be awarded to the farmer whose sample gives the highest yield.

This test offers a rare opportunity for farmers who have devoted much attention to seed selection, and who wish to demonstrate the excellence of their particular strains. Previous tests along these lines have been very successful in improving the yielding qualities of maize varieties, as well as creating a demand for seed.

The Department wishes to point out that it will be necessary to limit the number of entries to about twenty-five, and the right is also reserved of refusing any samples not sufficiently pure or true to type. This is essential in order that the purity of the seed at the farm will not be endangered.

Samples should be addressed to the Manager, Experiment Farm, Glen Innes, and further information concerning the test can be had on application to the Under Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney, or from the Farm Manager.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An Experiment in the Feeding of Pigs.

S. MEREDITH, Alstonville.*

As a general rule, the same amount of care in ensuring a sufficiency of mineral requirements in the foodstuffs of paddock-fed pigs is not so important or necesssary as in the case of sty-fed animals. Unless pigs are fed a ration that is absolutely deficient in, say, calcium or phosphates, their attention to any mineral mixture placed before them is somewhat casual. And, although I make it a rule of keeping a good mixture always before the pigs, the question of supplying the essential mineral elements certainly does not cause me any anxiety.

With reference to pigs suffering from a form of "staggers," the question recently presented itself in my mind as to whether there existed any relationship between the supply of minerals and vitamines in feeding-stuffs. Experiments have shown that a relationship does exist, as pigs, especially young growing stock, when kept in a darkened sty and fed on skim-milk and white corn without any green feed or other material containing vitamines, have exhibited decided symptoms of rickets. Skim-milk contains ample calcium for the requirements of any pig, even if the amount fed is as low as half a gallon a day, and, in addition, the calcium is in a form readily utilisable by the animal. The addition of cod-liver oil, which contains vitamines "A" and "D" (fat-soluble and anti-rachitic), to the feed has been shown to effect a cure.

Still, to my way of thinking, the actual relationship between the minerals and vitamines did not appear to be made sufficiently clear by the results of these experiments, and consequently I decided to carry out an experiment on the following lines.

Three sows were selected, all about four or five weeks off farrowing. For identification, these will be referred to as sow A, sow B, and sow C. Sows A and B were purebred Berkshires in pig to a purebred Berkshire boar, and C was a Tamworth sow in pig to the Berkshire boar. These sows were separated and fed apart from the rest of the herd. Sow A received a ration containing ample calcium, plus a tablespoonful of cod-liver oil per day mixed in her feed, and, in addition, she was run on a clover and grass pasture, while a portable shelter was provided.

Sow B was taken off pasture, put into a small sty with a concrete floor covered with timber and bedding, and was given a ration, lacking in lime, but containing ample phosphates and other minerals. She was, however, given a tablespoonful of cod-liver oil every day in her feed to ensure a supply of vitamines.

*** Articles under the name of Mr. S. Meredith are not new to readers, and the present contribution is interesting as giving some indication of the experimental work which a farmer can undertake if he is sufficiently interested.—*Editor***

Sow C was run in a small enclosure with very little grass, and was fed a ration containing calcium but no vitamines as far as was known. In due course, each sow farrowed with the following results:—

Sow A—11 pigs, all normal.
Sow B—10 pigs, 4 alive and 6 dead.
Sow C—10 pigs, 7 alive and 3 dead.

It was anticipated that sow B would possibly have stored in her body sufficient quantities of calcium to carry her litter through. On reflection, however, I realised that the feed she was receiving contained fairly large quantities of magnesium, and as proportionately large amounts of that element are not required, in voiding it the sow deprived herself of abnormal quantities of lime, "starving" her own body to that extent, and also robbing the unborn pigs, whose greatest growth is made during the last month of the gestation period.

Examination of the litters showed that sow A had a normal litter, well grown, and free from runts, while sow C had four apparently normal, two not quite as good, and one very small weakling which only lived about twelve hours, the dead pigs being all very small and poorly developed. Sow B. however, had ten perfectly-formed pigs, which would have been a splendid litter had all been born alive, the dead pigs averaging nearly 3 lb. each.

The conclusions arrived at are:—

1. That minerals, particularly calcium, are necessary for life processes, even in the unborn litter.
2. That the addition of cod-liver oil, containing vitamines "A" (fat-soluble) and "D" (anti-rachitic) is advisable to obtain good normal growth, if there is any reasonable doubt regarding their presence in the rations.
3. That there is an important relationship between calcium and vitamines "A" and "D," one being of little use without the other for sustaining life and ensuring normal growth.

This last point, to my mind, is most important, as comparatively little is known of vitamines and the possibilities of experimental work appear very great. The experiment also emphasises the value of legumes in a pasture, especially for the development of prenatal young as well as for the growth of pigs that are born normal, as legumes contain both calcium and vitamines.

It is also my opinion that the litter of sow A would have done equally as well without the addition of cod-liver oil to her ration, as I have since found out that it is rarely required where the pigs are allowed to run on a pasture that contains clover. To ensure the sow's obtaining every benefit possible, however, it was decided to include the oil.

After farrowing each sow was fed a normal ration and turned out on a good pasture. The way sows B and C tackled the grass and clover after being kept off it for so long was sufficient indication that Nature's supply of green feed was not only all important, but thoroughly appreciated.

Hand-feeding of Sheep Investigation at Nyngan Experiment Farm, 1927-28.

C. R. MULHEARN, B.V.Sc., Veterinary Research Officer, Council for Scientific and Industrial Research, and SIDNEY RUDKIN, N.D.A., Manager, Experiment Farm, Nyngan.

THE sheep on the Nyngan Experiment Farm have been set apart as a flock upon which investigations into sheep blowfly may be made, and Mr. Mulhearn is stationed there for the purpose of undertaking that work. The Farm, though not in the Western Division of the State, lies west of the Bogan River, is light carrying country of low rainfall and subject to drought. The question of hand-feeding during drought periods is therefore an important one concerning the flock as a whole, while the necessity for feeding sheep in closely confined pens or crowded on small areas (in certain investigational work), rendered it imperative to make observations concerning fodders available on the Farm to ascertain what ration would be capable of maintaining health in sheep kept under such conditions. Both the Manager, Mr. S. Rudkin, and Mr. Mulhearn were therefore keenly interested in the matter, and this work was arranged between them, certain additional observations being made on the wool by the Sheep and Wool Expert (Mr. E. A. Elliott) and a note on the cost of fodders by Mr. Rudkin.—H. R. SEDDON, Director of Veterinar Research.

The aim of the experiment was to study the result and to compare the value of feeding hay, silage and a mixture of the two, over an extensive period, to penned sheep, having regard to the effects upon their wool and general condition. The sheep used for the experiment were farm bred 2-toothed Merino ewes, and were of a uniform type, being large-framed, plain-bodied, and fairly even in the wool, as could best be judged at the beginning of the experiment, the sheep being then twelve weeks off shears. All were in strong store condition.

The Fodders Used.

The silage was made from a crop of Firbank wheat grown in 1925 on 830 points of rain, cut green and pitted immediately. No weeds were present in the crop and growth was not rank. When opened up for feeding, the top half of the pit was, to external appearances, a good sample of sour silage, possessing the customary smell and colour; the bottom layers were lighter in colour and comparatively wet, with a somewhat unpleasant odour. The sheep showed a preference for the latter, as evidenced by the less amount of feed wasted.

The baled wheaten hay, grown in 1927 on 356 points of rain, was of the variety Canberra. The sample contained small proportion of grain, due to harvesting operations being delayed owing to the unevenness of growth,

though patches contained a considerable quantity of well-filled grain. The hay throughout was of good colour and smell, no rain having been received whilst in the stook. Little waste was recorded.

The Sheep One Month After Commencement of the Test.
Top.—Hay Group.
Centre.—Hay and Silage Group.
Bottom.—Silage Group.

From previous practical experience it is known that sheep do better on baled hay than that in the sheaf, the crushing of the butts of the hay during the process of pressing no doubt accounting for this. The coarse, untasty butts, being broken up, are rendered soft and palatable, and probably more digestible.

Undoubtedly the quality of wheaten or oaten hay grown at Nyngan and in similar dry parts of the State is better than that produced in the more favoured rainy districts. Stock of all description show a preference for western-grown produce. Among racehorse owners in the district it is a recognised fact that locally-grown chaff is superior in this regard. When reviewing the results of the experiment it might be as well to bear this factor in mind. Would hay grown in the Cowra, Bathurst or Riverina districts produce similar results?

Details of Feeding.

The experiment was commenced on the 7th November, 1927, when twelve ewes were picked from the flock. Each bore a distinguishing number tattooed into the ear for future identification. They were divided into three approximately evenly-weighted groups as follows:—

Lot A.	lb.	*Lot B.*	lb.	*Lot C.*	lb.
L 113...	$89\frac{1}{2}$	L 107	$86\frac{1}{2}$	L 119	86
L 114...	82	L 166	$82\frac{1}{2}$	L 163	84
L 120...	$80\frac{1}{2}$	L 169	81	L 137	$82\frac{1}{2}$
L 135...	$77\frac{1}{2}$	L 130	80	L 136	$77\frac{1}{2}$
Total	$329\frac{1}{2}$		330		330

The groups were run in three neighbouring yards, each of which had ample shade and shelter; water was available from wooden troughs, and the feed

from wire-netting troughs lined with hessian. A salt lick of 5 per cent. Epsom salt in coarse salt was placed in each pen, and was replaced from time to time as it was consumed by the sheep.

Feeding was commenced on the 8th November, 1927, when rations were fed as follows :—

Lot A.—12 lb. hay, or 3 lb. per head daily (reduced to 2 lb. per head after three months).

Lot B.—6 lb. hay and 6 lb. silage, or 1½ lb. of each per head daily.

Lot C.—12 lb. silage, or 3 lb. per head daily.

The ration was given in two feeds daily on week-days (one in the morning and one at night) with one feed only on Sundays. The sheep ate the hay much more readily than the silage, and after a few days lots A and B were eating practically all their ration, whilst the sheep in lot C were only consuming a small portion; as a consequence the initial loss in weight was much greater in the last group than in either of the other two.

The First Weighing.

Feeding was continued at the rates quoted till 7th December, when the sheep were re-weighed with the following results :—

	Lot A.			*Lot B.*			*Lot C.*	
	lb.	lb.		lb.	lb.		lb.	lb.
L 113 ...	95	= gain of 5½	L 107 ...	84½	= loss of 2	L 119 ...	72	= loss of 14
L 114 ...	91½	= ,, 9½	L 166 ...	82	= ,, ½	L 163 ...	74	= ,, 10
L 120 ...	78	= loss of 2½	L 169 ...	78½	= ,, 2½	L 137 ...	72	= ,, 10½
L 135 ...	83	= gain of 5½	L 130 ...	82	= gain of 2	L 136 ...	75	= ,, 2½
Total ...	347½	= gain of 18	Total ...	327	= loss of 3	Total ...	293	= loss of 37

According to these weights Lot A did best, and as a group put on condition, only one sheep losing weight, this animal being 2½ lb. lighter than when last weighed. Lot B lost condition slightly, but were only 3 lb. lighte than when the experiment commenced. Lot C lost considerably, ranging up to 14 lb. in one sheep. The sheep in this group were noticeably in worse condition than in either of the other groups.

At the commencement of the feeding the sheep in Lot C would only nibble at their ration, and even when they started eating about a week later, they did not take their feed with the same relish as those in the other groups, nor did they consume the same quantity; hence one would expect a greater initial loss.

The refuse feed from the three pens from 7th November to 7th December, 1927, was :—Lot A, 44 lb.; Lot B, 30½ lb.; Lot C, 86 lb.

As the sheep in Lot A were leaving a considerable quantity of the coarse stalks of hay, and were thus only eating the better portion of their ration, they were given only 8 lb., or 2 lb. per head, daily as from 7th February, 1928—1 lb. per head less than they had been given previous to this date. This reduced ration was continued till the conclusion of the experiment. Lots B and C were maintained on their original rations right through the experiment.

Subsequent Weights.

The following tables give particulars of the rations fed, the monthly weights, comparisons of these weights and the refuse feed for duration of the experiment:—

Weights at 7th December, 1927.

Lot A. (Ration, 12 lb. hay daily.)

Sheep.	Weight.	Comparison with weight of previous month.	Comparison with weight at commencement.	Refuse feed.
	lb.	lb.	lb.	lb.
L 113	95	+5½	+5½	44
L 114	91½	+9½	+9½	
L 120	78	−2½	−2½	
L 135	83	+5½	+5½	
Total ...	347½	+18	+18	

Lot B. (Ration, 6 lb. hay and 6 lb. silage daily.)

Sheep	Weight.	Comparison with weight of previous month.	Comparison with weight at commencement.	Refuse feed.
	lb.	lb.	lb.	lb.
L 107	84½	−2	−2	30½
L 166	82	−½	−½	
L 169	78½	−2½	−2½	
L 130	82	+2	+2	
Total..	327	−3	−3	

Lot C. (Ration, 12 lb. silage daily.)

Sheep.	Weight.	Comparison with weight of previous month.	Comparison with weight at commencement.	Refuse feed.
	lb.	lb.	lb.	lb.
L 119	72	−14	−14	86
L 163	74	−10	−10	
L 137	72	−10½	−10½	
L 136	75	−2½	−2½	
Total..	293	−37	−37	

Weights at 7th January, 1928.

Lot A. (Ration, 12 lb. hay daily.)

Sheep.	Weight.	Comparison with weight of previous month.	Comparison with weight at commencement.	Refuse feed.
	lb.	lb.	lb.	lb.
L 113	93	−2	+3½	47
L 114	92	+½	+10	
L 120	75½	−2½	−5	
L 135	84	+1	+6½	
Total..	344½	−3	+15	

Lot B. (Ration, 6 lb. hay and 6 lb. silage daily.)

Sheep	Weight.	Comparison with weight of previous month.	Comparison with weight at commencement.	Refuse feed.
	lb.	lb.	lb.	lb.
L 107	84	−½	−2½	20½
L 166	77½	−4½	−5	
L 169	82	+3½	+1	
L 130	88	+6	+8	
Total..	331½	+4½	+1½	

Lot C. (Ration, 12 lb. silage daily.)

Sheep.	Weight.	Comparison with weight of previous month.	Comparison with weight at commencement.	Refuse feed.
	lb.	lb.	lb.	lb.
L 119	67½	−4½	−18½	92
L 163	70	−4	−14	
L 137	61½	−10½	−21	
L 136	70½	−4½	−7	
Total..	269½	−23½	−60½	

Weights at 7th February, 1928.

Lot A. (Ration, 12 lb. hay daily.)

Sheep.	Weight.	Comparison with weight of previous month.	Comparison with weight at commencement.	Refuse feed.
	lb.	lb.	lb.	lb.
L 113	96½	+3½	+7	46
L 114	93	+1	+11	
L 120	77	+1½	−3½	
L 135	86	+2	+8½	
Total..	352½	+8	+23	

Lot B. (Ration, 6 lb. hay and 6 lb. silage daily.)

Sheep	Weight.	Comparison with weight of previous month.	Comparison with weight at commencement.	Refuse feed.
	lb.	lb.	lb.	lb.
L 107	86½	+2½	...	10
L 166	77½	...	−5	
L 169	79	−3	−2	
L 130	89	+1	+9	
Total..	332	+½	+2	

Lot C. (Ration, 12 lb. silage daily.)

Sheep.	Weight.	Comparison with weight of previous month.	Comparison with weight at commencement.	Refuse feed.
	lb.	lb.	lb.	lb.
L 119	64	−3½	−22	108
L 163	60	−10	−24	
L 137	56½	−5	−26	
L 136	66½	−4	−11	
Total..	247	−22½	−83	

Weights at 7th March, 1928.

Lot A. (Ration, 8 lb. hay daily.)

Sheep.	Weight.	Comparison with weight of previous month.	Comparison with weight at commencement.	Refuse feed.
	lb.	lb.	lb.	lb.
L 113	93½	−3	+4	35
L 114	87½	−5½	+5½	
L 120	72	−5	−8½	
L 135	87½	+1½	+10	
Total..	340½	−12	+11	

Lot B. (Ration, 6 lb. hay and 6 lb. silage daily.)

Sheep	Weight.	Comparison with weight of previous month.	Comparison with weight at commencement.	Refuse feed.
	lb.	lb.	lb.	lb.
L 107	82	−4½	−4½	33½
L 166	80½	+3	−2	
L 169	76	−3	−5	
L 130	87	−2	+7	
Total..	325½	−6½	−4½	

Lot C. (Ration, 12 lb. silage daily.)

Sheep.	Weight.	Comparison with weight of previous month.	Comparison with weight at commencement.	Refuse feed.
	lb.	lb.	lb.	lb.
L 119	63½	−½	−22½	65
L 163	57½	−2½	−26½	
L 137	58	+1½	−24½	
L 136	64	−2½	−13½	
Total..	243	−4	−87	

Weights at 3rd April, 1928.

Lot A. (Ration, 8 lb. hay daily.)

Sheep.	Weight.	Comparison with weight of previous month.	Comparison with weight at commencement.	Refuse feed.
	lb	lb.	lb.	lb.
L 113	94	+½	+4½	51
L 114	89½	+2	+7½	
L 120	69	−3	−11½	
L 135	82½	−5	+5	
Total..	335	−5½	+5½	

Lot B. (Ration, 6 lb. hay and 6 lb. silage daily.)

Sheep	Weight.	Comparison with weight of previous month.	Comparison with weight at commencement.	Refuse feed.
	lb	lb.	lb.	lb.
L 107	84½	+2½	−2	14
L 166	79	−1½	−3½	
L 169	76	...	−5	
L 130	86½	−½	+6½	
Total..	326	+½	−4	

Lot C. (Ration, 12 lb. silage daily.)

Sheep.	Weight.	Comparison with weight of previous month.	Comparison with weight at commencement.	Refuse feed.
	lb.	lb.	lb.	lb.
L 119	65	+1½	−21	28
L 163	54	−3½	−30	
L 139	54	−4	−28½	
L 136	65½	+1½	−12	
Total..	238½	−4½	−91½	

Sheep.	Weight.	Comparison with weight of previous month.	Comparison with weight at commencement.	Refuse feed.	Sheep.	Weight.	Comparison with weight of previous month.	Comparison with weight at commencement.	Refuse feed.	Sheep.	Weight.	Comparison with weight of previous month.	Comparison with weight at commencement.	Refuse feed.
Weights at 22nd May, 1928.														
Lot A. (Ration, 8 lb. hay daily.)					*Lot B. (Ration, 6 lb. hay and 6 lb. silage daily.)*					*Lot C. (Ration, 12 lb. silage daily.*				
	lb.	lb.	lb.	lb.		lb.	lb.	lb.	lb.		lb.	lb.	lb.	lb.
L 113	95	+ 1	+ 5½	32	L 107	83	−1½	−3½	40	L 119	62	− 3	−24	123
L 114	91½	+2	+ 9½		L 166	82	+3	− ½		L 163	50½	− 3½	−33½	
L 120	64	−5	−16½		L 169	79	+3	−2		L 139	50	− 4	−32½	
L 135	83½	+1	+ 6		L 130	89½	+3	+9½		L 136	64	− 1½	−13½	
	334	−1	+4½		Total..	333½	+7½	+3½		Total..	226½	−12	−103½	
Weights at 2nd July, 1928.														
Lot A. (Ration 8 lb. hay daily.)					*Lot B. (Ration, 6 lb. hay and 6 lb. silage daily.)*					*Lot C. (Ration, 12 lb. silage daily.)*				
	lb.	lb.	lb.	lb.		lb.	lb.	lb.	lb.		lb.	lb.	lb.	lb.
L 113	101	+6	+11½	14½	L 107	88	+5	+ 1½	2½	L 119	69	+7	−17	½
L 114	92½	+1	+10½		L 166	84	+2	+ 1½		L 163	51	+ ½	−33	
L 120	69	+5	−11½		L 168	83	+4	+ 2		L 137	55	+5	−27½	
L 135	86	+2½	+8½		L 130	91	+1½	+11		L 136	67	+3	−10½	
Total..	348½	+14½	+19		Total..	346	+12½	+16		Total..	242	+15½	−88	
Weights at 30th July, 1928.														
Lot A. (Ration, 8 lb. hay daily.)					*Lot B.—(Ration, 6 lb. hay and 6 lb. silage daily.)*					*Lot C. (Ration, 12 lb. silage daily.)*				
	lb.	lb.	lb.	lb.		lb.	lb.	lb.	lb.		lb.	lb.	lb.	lb.
L 113	103	+2	+13½	4	L 107	89	+ 1	+ 2½	2	L 119	64	− 5	− 22	33
L 114	92½	...	+10½		L 166	84	...	+ 1½		L 163	50	− 1	−34	
L 120	70½	+1½	−10		L 169	81	− 2	...		L 139	51½	− 3½	− 31	
L 135	86	...	+ 8½		L 130	87½	− 3½	+ 7½		L 136	62	− 5	−15½	
Total..	352	+3½	+22½		Total..	341½	− 4½	+11½		Total..	227½	−14½	−102½	

The Body Weights.

Feeding was discontinued on 31st July, 1928, and the sheep were shorn on 1st August. The individual fleeces were weighed both before and after skirting. The skirted fleeces from the different groups were packed separately and forwarded to the Sheep and Wool Branch for expert examination and valuation.

The following table gives particulars of the body weights of the sheep at the beginning and end of the experiment.

TABLE OF BODY WEIGHTS.

Lot A.			*Lot B.*			*Lot C.*		
Sheep.	Original body weight.	Final body weight.	Sheep.	Original body weight.	Final body weight.	Sheep.	Original body weight.	Final body weight.
	lb.	lb.		lb.	lb.		lb.	lb.
L 113 ...	89½	95¼	L 107 ...	86½	80½	L 119 ...	86	58
L 114 ...	82	83	L 166 ...	82½	76½	L 163 ...	84	46
L 120 ...	80½	63¾	L 169 ...	81	72¾	L 137 ...	82½	46¼
L 135 ...	77½	79	L 130 ...	80	80¼	L 136 ...	77½	55½
Total...	329½	321	Total ...	330	310	Total ...	330	205¾

Examination of the sheep after shearing revealed lots A and B to be in good condition, with the former slightly better than the latter. The sheep in Lot C were in very poor condition. A valuation placed on the sheep based on their bodily condition immediately after shearing was—Lot A, 20s. per head; Lot B, 19s. per head; Lot C, 13s. 6d. per head.

Observations on the Experiments.

The sheep in Lot A, on a single ration of hay, did very well right through the experiment. At the first weighing one month after the commencement of feeding they showed a considerable increase in weight, and at no time during the experiment did they fall back to their original weight. For the first three months they were on a ration of 12 lb. of hay daily, and at the end of that period they were 23 lb. heavier than at the beginning of the experiment. At this time their ration was reduced to 8 lb. of hay daily, with the result that there was a loss of 12 lb. at the next weighing. They gradually lost weight during the next three months, till on 22nd May, 1928, they were only 4½ lb. above their original weight. From this date onwards, with the advent of the cold weather, they commenced to put on weight, till at the end of July they were again 22½ lb. above their original weight. At this time they carried more wool than at the commencement of the experiment, and when allowance was made for it, they had lost slightly in body weight, being 8½ lb. lighter.

Taking the individual sheep of the group, there was a considerable difference between L 120, which showed a big loss in weight (16¾ lb.), and the other three sheep (L 113, L 135, and L 114) which showed gains of 5¾ lb., 1½ lb., and 1 lb. respectively in actual body weight. At no time did L 120 do well on the ration of hay; she showed a loss in weight at the first weighing which was gradually increased till towards the conclusion of the experiment, when there was a slight gain.

Lot B, taken as a unit, remained fairly constant in weight for the major portion of the experiment. They showed a rise in weight during the cold weather, and on 2nd July, 1928, were 16½ lb. above their weight at the commencement of the experiment. The sheep from this group were always ready for their feed, which was usually all eaten. The refuse feed taken from this pen was considerably less than that taken from either of the other pens. The sheep remained very even in weight right through and there was only a difference of less than 8 lb. between the heaviest and lightest at the conclusion of the experiment. When allowance was made for fleece weight there was a loss in body weight of 20 lb.

Lot C, on the ration of 12 lb. of silage daily, did very poorly and lost weight continuously right through from the beginning to the end of the experiment, with the exception of one month when they received silage of better quality. At the conclusion of the experiment the sheep of this group were 102½ lb. lighter than their original weight, and when allowance was made for the

wool weight they lost in body weight an average of 31 lb. per head. All lost considerably, but L 163 and L 137 were the worst with losses of 38 lb. and 35¾ lb. respectively. As would be expected, this group cut lighter fleeces and poorer quality wool. The sheep did not eat very well for the major portion of the experiment, and the amount of refuse feed taken from the pen was far greater than from either of the other pens.


Hay Group.


Hay and Silage Group.


Silage Group.

The different Groups just Prior to and Immediately After Shearing.

At the time the photographs were taken the sheep had been nine months on these feeds.

An interesting comparison is that of twenty-four sheep from the same flock and of the same type as the experiment sheep, but which had been running with the general flock on the pastures during the period of the experiment. During this period the outside conditions were very good, and there

was an abundant supply of natural feed. The average body weight of these twenty-four sheep off shears was 97·5 lb. and the average fleece weight 11·9 lb. As compared with these figures the experiment sheep show at a disadvantage, particularly the Lot C, as is evident from the following table :—

Group.	Total body weight.	Average body weight.	Total fleece weight.	Average fleece weight.
	lb.	lb.	lb.	lb.
Lot A ...	321	80·2	31	7·75
Lot B ...	310	77·5	31½	7·87
Lot C ...	205½	51·4	21¾	5·43
Flock sheep ...	...	97·5	...	11·9

Conclusion.

The outstanding feature of the experiment was the great difference between Lots A and B on the one hand, and Lot C on the other. Lots A and B did well on their rations, and there was very little loss in weight, while in Lot C


1. 2. 3.

Fleeces from Sheep in Hay-and-silage Group (1), Hay Group (2), and Silage Group (3). The Fleeces in each group are stacked one above the other.

there was a considerable loss in weight, and the sheep were in a very poor condition at the conclusion of the experiment. From this it is evident that sheep can and will do well, and hold their condition when penned up and fed on either a single ration of hay or a mixed ration of equal parts of hay and silage for an extended period, and that sheep do badly and lose condition rapidly when confined to a ration of silage alone, even though it is abundant.

Observations on the Wool of the Sheep Used.

Mr. E. A. Elliott, Sheep and Wool Expert, reported as follows on the skirted fleeces :—

" On arrival in Sydney the fleeces in the trial were examined and valued carefully with the assistance of two leading wool appraisers. The following

table gives the results of the examination with their values. As the skirtings were not sent with the fleeces, an average value of 15d. per lb. was given to these :—

Sheep.	Total Weight.	Skirted Weight.	Skirtings (weight).	Yield.	Value per lb.	Value of Skirtings per lb.	Value of Skirted Fleeces.	Value of Skirtings.	Total Value.
	lb.	lb.	lb.	lb.	d.	d.	s. d.	s. d.	s. d.
					Lot A.				
L 113 ...	8½	6	2½	57	25	15	12 6	3 1½	15 7½
L 114 ...	9½	6¼	3¼	55	22	15	11 5½	4 0¾	15 6¼
L 120 ...	6¾	4¾	2	56	23½	15	9 3½	2 6	11 9½
L 135 ...	7	4¼	2¾	54	23¼	15	8 2¾	3 5¼	11 8
		Total	...	...	...	...	...	... ...	13 7¾
					Lot B.				
L 107 ...	8½	5½	3	58	25½	15	11 8¼	3 9	15 5¼
L 130 ...	7¼	5	2¼	58	26½	15	11 0½	2 9¾	13 10¼
L 166 ...	7½	5	2½	57	24	15	10 0	3 1½	13 1½
L 169 ...	8¼	4¾	3½	55	23	15	9 1¼	4 4½	13 5¾
		Total	...	...	...	...	...	... ...	13 11¾
					Lot C.				
L 119 ...	6	3¾	2¼	53	21¼	15	6 7½	2 9¾	9 5¼
L 136 ...	6½	4¼	2¼	48	18¾	15	6 7¾	2 9¾	9 5½
L 137 ...	5¼	3¾	1½	57	23½	15	7 4	1 10½	9 2½
L 163 ...	4	2¾	1¼	55	22	15	5 0½	1 6¾	6 7¼
		Total	...	...	...	...	...	... ...	8 8¼

" A slight unevenness of three of the fleeces from the remainder is to be regretted, as the results were affected. The fleeces in question were those of L 113 and L 114 in Lot A, which were slightly stronger in quality and more bulky than any other fleeces, and on account of their greater weight (not due to the feed) the lot gained a slight advantage due to their presence. The other fleece was that of L 136 in Lot C, which was very heavy conditioned and discoloured, and, as the valuation shows, the Lot suffered because of the lower price per lb. Except for these the fleeces must have been a fairly even lot at the commencement of the trial. To ensure evenness of the fleece, sheep for later trials should be selected in the wool.

" Lot A showed generous condition. The fleeces were attractive, but as stated, two fleeces being stronger in quality, the lot was not particularly even.

" Lot B also had a fair amount of condition, but, as seen by the yield, was on the average slightly lighter than Lot A. This lot was very attractive in appearance and colour.

" Lot C showed all the results of semi-starvation. The fleeces were hungry, fine, contained no " body " and were badly nourished, except for one fleece, which, as stated, contained a large amount of a sticky type of yolk.

" The gentlemen who inspected and valued the fleeces were not told anything about them until after the valuations were received."

Observations on the Cost of the Fodder Used.

Though the experiment was not conducted with the object of comparing costs of feeding, a review of costs is of interest in connection with any future feeding trial. Mr. S. Rudkin, Manager of Nyngan Experiment Farm, has supplied the following particulars relating to the trial under review:—

"The fodders used may be valued as follows:—Silage, £1 per ton in the pit; baled hay, £3 10s. per ton in the shed. In the following costs no allowances are made for labour in feeding. With silage the labour costs would be heavier, estimated at the rate of silage three, hay one. In actual practice no additional labour would be engaged on a holding whether the sheep were fed on silage or hay; one would call for harder work and longer hours than the other.

"The cost of the fodder consumed by each lot was as follows:—

"*Lot A.*—Net hay consumed in 38 weeks was 2,179 lb., valued at £3 8s. 1d. = 17s. per sheep = £89 11s. 8d. per 1,000 per four weeks.

"*Lot B.*—Net hay consumed was 1,535 lb. valued at 47s. 11d.; net silage consumed was 1,474 lb., valued at 13s. 2d.; totalling £3 1s. 2d. = 15s. 3½d. per sheep = £79 7s. 11d. per 1,000 for four weeks.

"*Lot C.*—Net silage consumed was 2,576 lb., valued at £1 3s. = 5s. 9d. per sheep = £30 5s. 2d. per 1,000 for four weeks.

"The following statements show the net cost of feeding the four sheep in each lot over the period of thirty-eight weeks:—

Lot A.

	£	s.	d.		£	s.	d.
Value of sheep at commencement (four at 23s.)	4	12	0	Value of sheep at end (four at £1)	4	0	0
Cost of feed	3	8	1	Value of wool clip	2	14	7
				Debit balance (net cost) ...	1	5	6
Total ... ... £	8	0	1	Total ... ... £	8	0	1

Lot B.

	£	s.	d.		£	s.	d.
Value of sheep at commencement (four at 23s.)	4	12	0	Value of sheep at end (four at 19s.)	3	16	0
Cost of feed	3	1	2	Value of wool clip	2	15	11
				Debit balance (net cost) ...	1	1	3
Total ... ... £	7	13	2	Total ... ... £	7	13	2

Lot C.

	£	s.	d.		£	s.	d.
Value of sheep at commencement (four at 23s.)	4	12	0	Value of sheep at end (four at 13s. 6d.)	2	14	0
Cost of feed	1	3	0	Value of wool clip	1	14	8
				Debit balance (net cost) ...	1	6	4
Total ... ... £	5	15	0	Total ... ... £	5	15	0

Preliminary Experiments in Cabbage Moth Control.

W. L. MORGAN, B.Sc.Agr., Assistant Entomologist.

In this progress report on cabbage moth control experiments details are given in regard to some initial tests carried out last season.

The observations made and the results obtained from these experiments show that the majority of the growers would market just as many cabbages or cauliflowers, and of a better quality than at present, if they were to plant smaller areas and adopt more thorough control measures. Planting, cultivating and manuring large areas, and treating them inadequately for moth control requires more work and expense than smaller areas more carefully attended to. A combination of dusting and spraying would give much better results for practically all growers, and particularly for the large number who breed the moth in abundance in old neglected plots and seed-beds.

Importance of the Pest.

During seasons of severe infestation, cabbage-growers find extreme difficulty in producing a crop of cabbages free from moth damage. The losses experienced by market gardeners in the county of Cumberland have been estimated as follows:—Up to 20 per cent. of the plants in early autumn crops do not form marketable hearts, while the size and the quality of the remainder usually suffer considerably. Should the moth, however, become particularly prevalent, which may occur every three or four years, perhaps less than 50 per cent. of the crop would be marketed. Varieties planted in late autumn and maturing in the early spring, however, usually escape severe damage, the losses being inconsiderable.

In the colder parts of the State spring crops can be grown successfully, but during the summer months the moth breeds so prolifically in most localities that cabbages cannot be grown successfully. Growers of small plots for home consumption usually adopt no control measures, the result being that the crop is often ruined by the moth, or, at the best, only a percentage of the plants are fit for eating purposes.

Cauliflowers, which are even more susceptible to moth damage than cabbages, are grown during the cool months when the moth is least prevalent.

Factors Influencing Attack.

Experience shows that the moths are much more active and lay their eggs very freely in warm, sunny weather; therefore, plots planted during such weather are liable to much heavier infestation than those planted a few

days before or after or during cooler weather. Furthermore, not only are there fewer active moths when the days are cool, but under such conditions the plants "take" well and are better able to resist attack. Finally, plants that are favoured with ideal growing conditions may "grow away" from a heavy infestation, which, under less favourable conditions for plant growth, would ruin the crop. Some varieties can stand very heavy infestation and yet form sound hearts, while other varieties run to seed under a similar infestation.

Present Methods of Control.

Arsenate of lead spray.—In most localities there are numerous cruciferous weeds, vegetables, or even garden flowers, upon which the moth develops readily, and these plants provide a continuous source of infestation for any cabbages or cauliflowers which are planted out, and at the same time render ineffective spraying or other treatments.

Some growers obtain satisfactory results from arsenate of lead spray, when the plants are treated at regular and frequent intervals and old plots and seed-beds are attended to. By cleaning up these sources of infestation the young crop is lightly attacked to begin with, and by spraying thoroughly during the early stages of growth the grub is kept in check until the heart commences to form. Then, although it becomes more difficult to reach the grubs by spraying, if the plants are kept growing vigorously they usually cut good hearts.

Lime and tobacco dust.—The use of lime and tobacco dust in the early morning is favoured by many growers largely because of its cheapness, coupled with the fact that it is easy to apply. Again, dusting can be done three or four times more quickly than spraying. The dew on the plants dissolves the dust to form a tobacco extract, which kills the grubs it comes in contact with.

Dusting with lime and tobacco is practised largely by growers of autumn crops, who choose a variety of cabbage for early autumn plantings, which, as soon as the cold weather commences to act as a check on the moth, will quickly recover from the effects of a severe infestation. Lime and tobacco dust gives sufficient control to keep the plants growing vigorously until the advent of cold weather, when infestation becomes greatly reduced. In favourable seasons 80 ot 90 per cent. of marketable cabbages are obtained by using lime and tobacco, but when the winter is late and infestation severe a percentage of the plants are killed by the grubs, while the remainder become so stunted that they tend to run to seed rather than to form hearts.

The Experiments.

To test the value of lime and tobacco, and arsenate of lead as against certain other substances, an experiment was commenced on 28th March, 1929, at Sydney. Four plots were used, 5,000 plants geing treated in all.

The plots were subdivided so as to give a minimum of 120 plants for each treatment. The following insecticides were tested:—

(1) Tobacco dust and hydrated lime (one part of each).
(2) Arsenate of lead (1 part) and hydrated lime (4 parts).
(3) Arsenate of lead (1 part) and hydrated lime (9 parts).
(4) Nicotine sulphate (1 in 600), plus soap (1½ lb. to 50 gallons).
(5) Emulsified white oil (1 part in 60 parts of water).
(6) A proprietary derris compound.
(7) Lead arsenate (Brand 1) and soap.
(8) Lead arsenate (Brand 1) alone.
(9) Lead arsenate (Brand 1) and casein-lime spreader.
(10) Lead arsenate (Brand 2) and soap.
(11) Lead arsenate (Brand 2) alone.
(12) Lead arsenate (Brand 2) and casein-lime spreader.

Arsenate of lead was used at the rate of 1½ lb. to 50 gallons of water. Where soap was used it was added at the rate of 1½ lb. to 50 gallons.

The casein and lime spreader was used at the rate of 5 oz. of casein to 50 gallons of spray. Hydrated lime was used in the proportion of seven parts to three parts of casein.

Frequency of Application of the Insecticides.

Dusting.—During the first three weeks dusting was carried out every three to five days, it being impossible to dust at fixed intervals owing to absence of dew, or because of rain. Thereafter the plots were treated about once a week.

Spraying.—As nearly as possible, intervals of ten days elapsed between spray applications. Where rain occurred shortly after spraying, the plot would be re-sprayed as soon as it ceased.

Results of the Experiments.

Emulsified white oil, a derris compound, and nicotine sulphate.—After the second application of each of these three sprays it became evident that the plants were not being sufficiently protected from the grubs, consequently further testing of these sprays was abandoned.

Arsenate of lead sprays.—Only the first two applications of each of the two different brands of arsenate of lead (used with or without a spreader) succeeded in keeping the grubs in check. During the next six weeks the degree of infestation steadily increased in spite of the fact that the plants were being sprayed every ten days.

The chief reasons why an arsenate of lead spray will not control a heavy infestation are as follows:—The grubs feed indiscriminately over the plant for the first three or four weeks after planting, during which time the spray gives good control, but as the outer leaves become older and tougher the

grubs turn their attention to the more tender centre leaves, and are much more difficult to destroy, because (*a*) the curled and folded centre leaves make it difficult for the spray to penetrate sufficiently, and (*b*) a webbing is spread over these leaves by the grubs, and this again increases the difficulty of covering these leaves with the arsenical spray. Thus, plots sown in February and sprayed only with arsenate of lead were so severely infested during April and May that they made practically no further growth. While the outer leaves were comparatively undamaged, the centre ones were eaten away as quickly as they developed, and there was therefore no increase in the size of the plants. Later, however, with the advent of cold weather, the grubs were greatly reduced in numbers and the plants made some growth, but were by that time so stunted that the majority tended to run to seed rather than to form marketable hearts.

Spreaders.—There was some evidence that soap and lead arsenate checked the plants' growth somewhat, although no actual burning of the foliage occurred. The cause of this was not determined. In addition the soap tended to throw the arsenate of lead out of suspension, and the latter was deposited unevenly, rather than as a smooth film, over the leaves.

Casein and lime proved a valuable spreader for arsenate of lead spray on cabbages. It holds the arsenate in suspension well and wets the surfaces satisfactorily, leaving a smooth film on the foliage. One pound of casein, costing 1s. 3d., would be sufficient to treat 6,000 to 8,000 half-grown plants if used at the rate of 5 oz. to 50 gallons of spray. Excellent results were obtained by mixing the lime, casein, and arsenate of lead together in the dry state, tipping the mixture into a kerosene tin and then turning the tap on full force so as to agitate the contents thoroughly. This eliminates the slow process of first mixing the casein and lime thoroughly in the dry state, then adding water slowly and stirring vigorously to form a paste.

Dusts.—The dust composed of one part of arsenate of lead and nine parts hydrated lime did not give effective control, 10 per cent. of the plants being killed off by the grubs by the end of the third week, though the plants had been dusted on an average of once every five days. A dust comprising one part of arsenate of lead to four parts of hydrated lime gave better results, it being equivalent to spraying with arsenate of lead. However, as the cost of dusting is higher than spraying, it could not be recommended in preference to spraying with lead arsenate.

Lime and tobacco dust.—The majority of plots that were treated with lime and tobacco dust at Sydney this year were failures, only a few of the very early or the very late plantings of the variety used in the experiments cut good hearts. Many of the plants in the most heavily infested plots were killed, while the outer leaves of the plants that survived were eaten away to the midribs. The centre leaves retained the dust better, and consequently were not so severely damaged, and as fast as the outer leaves were eaten away fresh leaves developed from the centre. These plants, like

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those sprayed with arsenate of lead, did not increase in size until the cooler weather checked the moth.

Spraying in Combination with Dusting.

The results obtained with arsenate of lead sprays and lime and tobacco dust in the tests so far carried out show that the former treatment gives a measure of protection to the outer leaves, while the latter protects the centre leaves more effectively. Such results suggested combining the two as a means of control, and an experiment was therefore planned to test the value of the combined treatment. It being too late to commence with a freshly-sown plot, one was chosen in which infestation was so severe that the plants were of no prospective value for crop production. The previous treatment had been to dust with lime and tobacco at least once a week. Half the plot was therefore sprayed with arsenate of lead on 6th April, 1929, while the other half still received the dust. Ten days later there was a very striking difference in the two halves. In the sprayed plants the grubs which were feeding on the outer leaves were poisoned, and these plants in the short space of ten days grew to be almost twice as large as those of the other section. Each of these two halves was then divided so that the plot consisted of four sections, No. 1 section received lime and tobacco dust; No. 2, arsenate of lead spray followed by dusting with lime and tobacco; No. 3, arsenate of lead spray; and No. 4, arsenate of lead spray followed by dusting with lime and tobacco.

No. 1 section remained heavily infested and the plants made no growth; No. 3 made good growth for a time, but the hearts soon became heavily infested; Nos. 2 and 4 were remarkably free of grubs and made excellent growth. The manner in which these extensively damaged and stunted plants recovered under combined spraying and dusting treatments is regarded as very promising. The lime and tobacco dust may be applied straightway after spraying while the plants are still wet. However, it would be more satisfactory to apply the dust on the first dewy morning after spraying. Spraying should be done as thoroughly as is practicable, because a large number of the eggs are laid on the undersurface of the outer leaves and the freshly-hatched grub usually feeds there before migrating to the younger leaves of the centre.

When dusting the aim need be to cover the centre leaves only, as experiments have shown that the outer leaves are protected quite satisfactorily by spraying with lead arsenate. It is probable that lime and tobacco dust has a repellent action on the grub and dusting the centre leaves would therefore drive the grub onto the outer leaves.

Generally speaking, the aim should be to dust about once a week and to spray every week to ten days, but the observant grower will regulate these according to the degree of infestation. It cannot be too strongly emphasised that the plants must be treated sufficiently often to keep them clean during their early growth.

Seed-bed Treatment and Clean Cultivation Important.

Most growers experience great difficulty in keeping the seed-bed free of grubs. The combination of dusting and spraying would give excellent results.

The butts from an old crop and any unsaleable plants are usually allowed to remain in the ground long after the crop has been cut. These constitute a continuous source of infestation for any fresh crop, and consequently an effort should be made to clean up such patches as soon as possible after the crop is off the ground. Old seed-beds, from which no more plants are needed, breed an enormous number of moths. These beds should be digged or ploughed in as soon as all the plants that are required have been taken from them. Much benefit would even be gained by pulling up all these plants.

Summary of Control Measures.

(1) The results pointed to a double treatment, consisting of spraying with arsenate of lead and dusting with lime and tobacco dust, as being likely to give a satisfactory control. The arsenate of lead was applied at the rate of 1½ lb. to 50 gallons of water every ten days, and was alternated with dusting with lime and tobacco (equal parts) once a week.

(2) Lime and tobacco dust used by itself gave fair protection to the central leaves, and is therefore valuable in control.

(3) Arsenate of lead spray, with the addition of a spreader, did not give sufficient control of grubs on the centre leaves, although the outer leaves were protected satisfactorily.

(4) It is essential, however, that cleaning up old plots and seed-beds be carried out in order to reduce initial infestation of fresh plots to a minimum.

(5) During these tests there was an unusual prevalence of moth; therefore, further experiments are to be carried out with the foregoing and other methods of control.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1929.

Ardlethan	Oct. 2
Quandialla	,, 2
Walbundrie (H. G. Collins) ...	,, 2
Hay (G. McCracken)	,, 2, 3
Narrandera (J. D. Newth) ...	,, 8, 9
Manildra (P. Rubie)	,, 8, 9
Ariah Park	,, 9
Bribbaree	Oct. 9
Griffith	,, 15, 16
Carcoar	,, 16
Taree Spring Show (C. A. Jackson)	,, 16, 17
Cootamundra (R. D. Beaver) ...	,, 22, 23
Deniliquin (D. Fagan)	,, 22, 23
Millthorpe (H. P. Smith) ...	,, 22, 23

1930.

Uralla (D. G. Evans)	Feb. 26, 27
Gunning (G. E. Ardill)	,, 27, 28, Mar. 1
Wallamba (E. A. Carey) ...	Mar. 6, 7
Rydal (H. Murray)	,, 7, 8
Dorrigo (J. H. Skeoch)	Mar. 12, 13
Kempsey (E. Mitchell)	,, 26, 27, 28
Sydney Royal (G. C. Somerville)	April 15 to 26
Grafton (L. C. Lawson)... ...	May 7 to 10

Improvement of Citrus Fruits.

Work of the Co-operative Bud Selection Society Ltd.

C. G. SAVAGE, R.D.A., Director of Fruit Culture, and R. J. BENTON, Special Fruit Instructor.

With the main purpose in view of improving the strains of citrus fruits grown in this State, meetings were convened of representatives of the Agricultural Department, Fruitgrowers' Federation of New South Wales, Central Citrus Association (N.S.W.) Co-operative Ltd., and the New South Wales Association of Nurserymen. It was realised that whatever was done would have a big influence upon the Australian citrus industry, as approximately 90 per cent. of the citrus trees planted in Australia are raised in New South Wales.

In order to place the work on a commercial basis it was deemed desirable to form the Co-operative Bud Selection Society, the directors of which were elected from the Fruitgrowers' Federation, the Central Citrus Association, and the Nurserymen's Association. The society commenced to function in May, 1928.

The first duty of such a society was to locate trees which were producing fruit of the desired type. In this connection the Departmental fruit inspectors in the citrus areas were issued with descriptions of the desired types of fruit, and instructed to locate trees from which bud wood could be obtained. From these trees further selections were made by a committee appointed by the society, in conjunction with the Special Fruit Instructor specialising in citrus fruits, to insure uniformity in the supply of buds. This means of supplying buds of good type fruits is only a temporary arrangement, intended to bridge over the gap until such time as the society is in a position to supply buds from selected trees of which performance records have been kept. With this end in view the society and Departmental fruit inspectors are keeping records of many blocks of trees, and the data being collected will record the quality of the fruit, the crop returns, liability of the tree to variation, and other outstanding characteristics. In four to five years the society will be in a position to supply selected buds from trees of which definite performance records are known.

The work of bud selection is being carried much further by the Agricultural Department, and the propagation of "pedigreed" trees from which selected buds will be available is being placed upon a sound foundation. Already many buds have been selected by Departmental officers from desirable strains of citrus trees, the history of which is definitely known. Performance records of the trees raised from these buds will be kept and further selections will be made from these. When trees are evolved with the desired characteristics and show little or no tendency towards variation, selected buds from them will be sold as certified buds for propagation purposes.

During the past season the Bud Selection Society proposed to supply buds of both the Washington Navel and Valencia Late oranges, but owing to the very dry summer a supply of suitable navel buds was not available. Valencia Late buds were sold to the following nurserymen during the 1929 budding season, trees from which should be available for planting in 1930.

	Buds.
T. Adamson, Ermington	3,100
T. Eyles, Rydalmere	3,500
F. Ferguson and Son, Hurstville	1,500
R. Hughes, Ermington	1,000
G. McKee, Ermington	3,000
L. P. Rosen and Son, Epping	11,500
Swane Bros., Ermington	500
C. E. Vessey, Eastwood	2,000

Tubercle-free Herds.

Of the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number tested.	Expiry date of this Certification.
Riverstone Meat Co., Riverstone Meat Works, Riverstone	121	5 Sept., 1929
Kyong School, Moss Vale	2	21 ,, 1929
Blessed Chanel's Seminary, Mittagong	4	25 ,, 1929
Walaroi College, Orange	5	30 ,, 1929
J. L. W. Barton, Wallerawang	22	11 Oct., 1929
W. McLean, Unanderra	44	1 Dec., 1929
Department of Education, Brush Farm, Eastwood	8	5 ,, 1929
Lunacy Department, Morisset Mental Hospital	21	7 ,, 1929
J. Davies, Puen Buen, Scone (Jerseys)	39	12 ,, 1929
Kinross Bros, Minnamurra, Inverell (Guernseys)	73	14 ,, 1929
Lunacy Department, Callan Park Mental Hospital	22	19 ,, 1929
Miss Brennan, Arrankamp, Bowral	14	20 ,, 1929
E. S. Cameron, Big Plain, Narrandera	39	10 Jan., 1930
Lunacy Department, Rydalmere Mental Hospital	68	11 ,, 1930
G. A. Parrish, Jerseyland, Berry...	77	12 ,, 1930
New England Girls' Grammar School, Armidale	28	16 ,, 1930
G. Miller, Casula	15	1 Feb., 1930
Queanbeyan Municipality (various owners)	41	1 ,, 1930
St. Joseph's Convent, Reynold-street, Goulburn	5	19 ,, 1930
St. John's Boys' Orphanage, Goulburn	9	19 ,, 1930
St. Michael's Novitiate, Goulburn	5	20 ,, 1930
Department of Education, Yanco Agricultural High School	32	23 ,, 1930
Lunacy Department, Kenmore Mental Hospital	81	28 ,, 1930
St. Joseph's Girls' Orphanage, Kenmore...	9	1 Mar., 1930
Tudor House School, Moss Vale	8	6 ,, 1930
Department of Education, Hurlstone Agricultural High School ...	42	10 April, 1930
Navua Ltd., Grose Wold, via Richmond (Jerseys)	10	11 ,, 1930
Australian Missionary College, Cooranbong	43	17 ,, 1930
Department of Education, Gosford Farm Homes	37	24 May, 1930
William Thompson Masonic School, Baulkham Hills	27	24 ,, 1930
F. W. Hopley, Leeton	29	29 ,, 1930
J. F. Chaffey, Glen Innes (Ayrshires)	56	29 ,, 1930
P. Ubrihien, Corridgeree, Bega	119	8 June, 1930
E. P. Perry, Nundorah, Parkville (Guernseys)	23	14 ,, 1930
Sacred Heart Convent, Bowral	11	17 July, 1930
Marion Hill Convent of Mercy, Goulburn	19	19 ,, 1930
A. Shaw, Barrington (Milking Shorthorns)	104	2 Aug., 1930
St. Patrick's College, Goulburn	9	7 ,, 1930
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	52	17 ,, 1930
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	78	4 Sept., 1930
James McCormick, Tumut	94	5 ,, 1930

—Max Henry, Chief Veterinary Surgeon.

Orchard Notes.

OCTOBER.

C. G. SAVAGE and H. BROADFOOT.

Codling Moth.

In the earlier districts prudent growers will have already taken active measures to combat the codling moth, but in later districts the first steps in control will be commenced during the current month. There should be little need to stress the fact that the measures adopted must be timely and thorough—thorough not only in scattered orchards, but throughout the whole of any given district. The value of even the most effective measures are rendered almost useless if a neighbouring grower is careless or indifferent in regard to control. The methods of control are well known to almost every grower, and they include thorough inspection of all sheds, packing cases, and bandages. It is always well to remember that one season's infestation is due to the carry-over grubs of the previous season.

Bandages when placed upon the trees provide a convenient shelter for the grubs. The bandages should therefore be carefully examined every fortnight, and all sheltering grubs destroyed. All loose bark and the butt of the tree at ground level should also be closely examined, as the grubs frequently take shelter in such places.

The first or calyx spray is one of the most important controls, and it is often advisable to give a second calyx spraying because of the fact that all stages in the development of the flowers do not synchronise. The spraying should be forcible enough to drive the poison into the calyx, otherwise the spraying loses much of its efficacy. Care should be taken to use the exact quantity of lead arsenate prescribed, and the mixture should be thoroughly mixed before commencing to spray, and should be kept well agitated during the operation.

The time during which spraying can be most effectively carried out is short, as many apple and pear trees reach the proper stage for spraying almost simultaneously, which means that, in the case of large orchards, long hours have to be worked if the work is to be done speedily and thoroughly. There must be no relaxation of effort, as the foe is insidious, numerous, and persistent, and, as has been previously remarked, precautionary measures are preferable to remedial efforts.

After-care of Buds and Grafts.

Upon grafted or budded stock there is always a chance of growths from the stock developing so vigorously as to rob the bud or graft of nourishment. Thorough periodical examination should be practised to keep such growths in check, but at the same time all such growths should not be destroyed, as they afford beneficial shade for the stock. Moreover, in the event of buds or

grafts failing, these outgrowths from the stock are needed upon which to re-bud or re-graft should such be necessary. The best plan is to pinch back the weaker shoots until the grafts or buds have developed sufficiently to form a head.

The Cultivator.

The conservation of soil moisture being necessary as a precaution against dry spells, the cultivator should be kept at work in order to maintain the surface soil in a proper condition. Besides helping to maintain a surface mulch, the cultivator will destroy weed growth. In fact, its use does more than this; it encourages vigorous tree development and vigorous bud development. Keeping the soil in good tilth is a very important factor in successful orchard management.

Surface Drains.

Reference has already been made to dry spells, and although it may seem absurd to advocate surface drains in districts that experience such droughty condition, orchardists know full well that the heavy downpours experienced in the intervening periods make surface drains very necessary for carrying off surplus water with the least possible loss of soil and plant foods. In the planning of these drains care is essential in order to secure the easiest slope and to ensure the most economical distribution of the drains.

Aphis.

Upon the first signs of aphis infestation on drupaceous trees, such as Japanese plum, peach, nectarine, and cherry, they should be sprayed with tobacco wash or one of the commercial nicotine extracts. Use a high pressure when spraying, and repeat the operation, if necessary, after an interval of two or three days.

Infectious Diseases Reported in August.

THE following outbreaks of the more important infectious diseases were reported during the month of August, 1929:—

Anthrax	Nil.
Blackleg	7
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia contagiosa	6
Swine fever	Nil.
Contagious pneumonia	Nil.

—MAX HENRY, Chief Veterinary Surgeon.

Germany's Honey Imports.

DURING 1928, Germany imported 20,617,300 lb. of honey, of which 6,333,800 lb. came from U.S.A. Canada supplied 280,000 lb.

Poultry Notes.

October.

E. HADLINGTON, Poultry Expert.

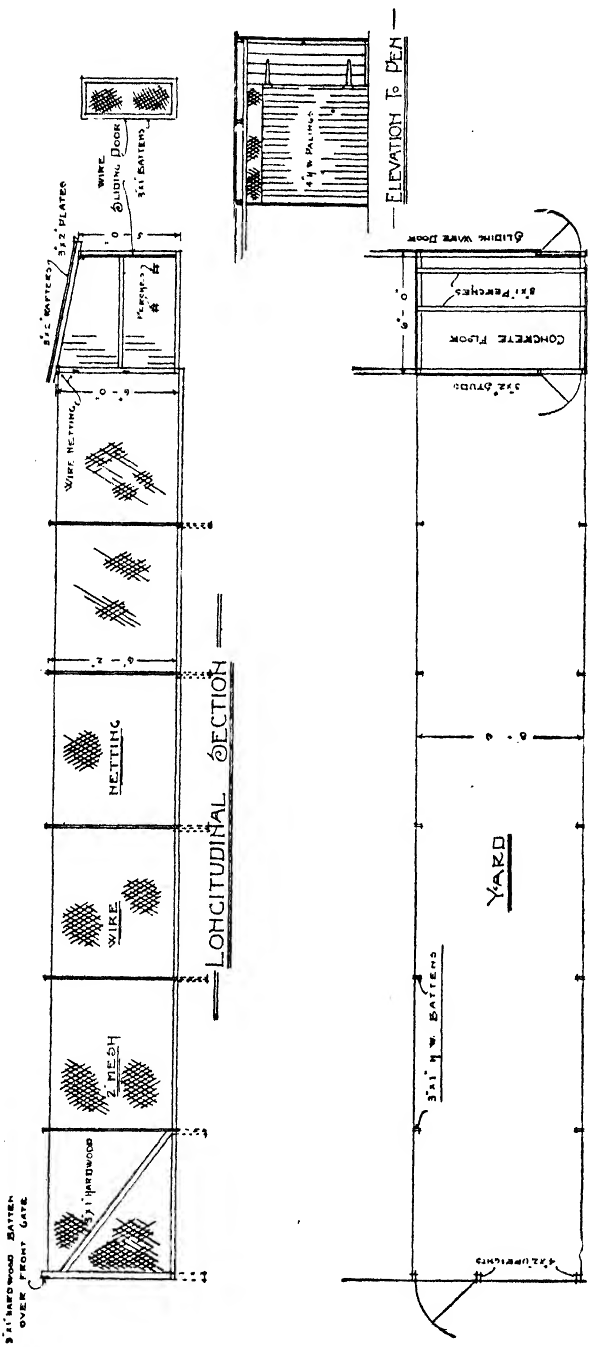
Up to the present the chicken-rearing season appears to have been more successful than usual, and those who commenced operations early can by now look upon most of the chickens as being beyond the danger period.

There are many, however, who leave the hatching operations until later in the season, and consequently have large numbers of chickens still in the critical stages, and it is among these that the inexperienced are likely to sustain losses during this month. What often occurs is that as the warmer

Suitable Pens for Second Stage of Rearing.

weather sets in it is thought that the chickens no longer require any artificial warmth, and the brooder heater is either allowed to go out altogether or it is neglected, and when a cold change comes up the chickens get a chill before the brooders can be warmed up again.

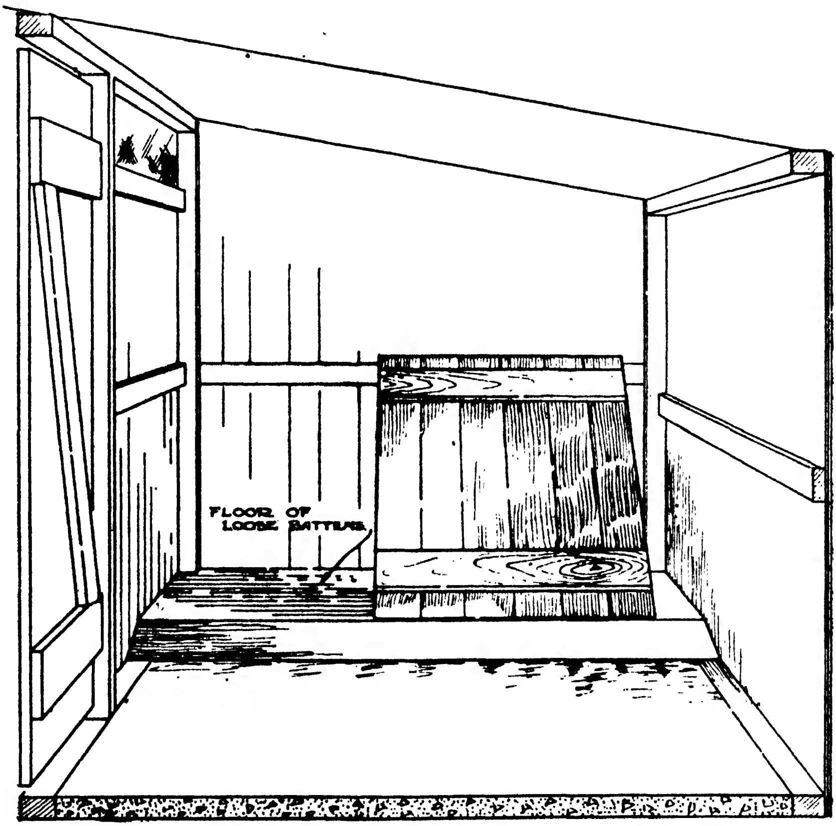
In other cases the heater is not kept going in the day-time when it is warm, and is not re-lit early enough in the afternoon to have the brooders at the right temperature for the chickens to go up in. This results in their packing together, with disastrous results. The weather at this time of the year is usually so changeable that the only safe course is to keep the brooder heater going in the day-time, not, of course, at its maximum temperature during a warm day, but just so that the brooders can be warmed up again at short notice. Neglect in this matter is one of the main reasons why so much trouble is usually met with among the later chickens. It should be realised that even greater care is necessary at this time than in the cold weather, when more even temperatures are ruling.



Details of Chicken-rearing Pens.

A trap-door 15 in. x 12 in. can take the place of the ledge-door opening into the yard.

Another source of trouble is the practice of putting chickens under six weeks old out of the brooders into the next stage of the rearing equipment as soon as a warm spell comes. Perhaps a day or so after they are put out a cold change arrives and the chickens in crowding to get warm are sweated, and, later, some lose their downy feathers and become almost bare. This results in their being stunted and ruined. If the chickens are put out much under six weeks old, the same conditions may result in serious mortality.

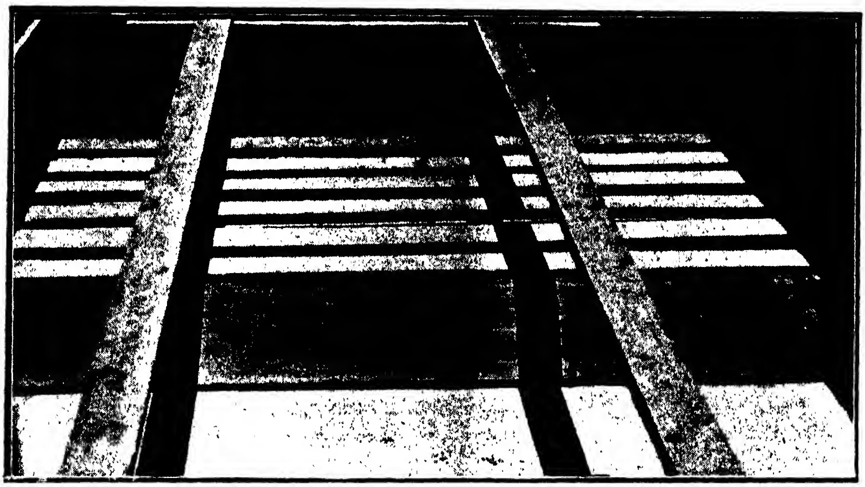


Interior of Rearing Pens, showing Movable Platform and Cover Board in Position.

After the Brooder Stage.

While there is a gradual awakening to the necessity for proper brooding equipment, the handling of the chickens after they are taken from the brooders leaves much to be desired, and many chickens that have come safely through the brooding stage are practically ruined by being subsequently housed in unsuitable quarters. On numerous farms the chickens are put out into open-fronted houses without any effective methods of preventing them from crowding together, and in consequence they sustain a check in growth, if not something worse.

The class of building found most effective on Departmental farms and also on private farms where adopted is as illustrated. These pens, being erected in a continuous line, are convenient to attend to (which means a saving of labour), and the chickens do well in them up to about twelve weeks of age, by which time they should have learnt to roost. The dimensions of the houses and runs are as follows:—House, 8 feet x 6 feet, being 6 feet high at the front and 5 feet at the back; run, 30 feet to 40 feet long, by 8 feet wide, with 6 feet netting fences. Each pen will accommodate up to seventy-five chickens when six weeks old, but if they are allowed to remain until twelve weeks of age the numbers should be reduced somewhat as they grow. It is essential that some method be adopted for teaching the birds to roost and the system here illustrated will be found quite satisfactory for the purpose if used as intended.



Arrangement of Platform for Inducing Chickens to Roost.

As many pens as are required to be filled with chickens at one time should be fitted at the end farthest from the door, with a movable platform of battens as shown. Ten or twelve battens should be placed close together for the first few nights until the chickens get accustomed to going onto them, and then by taking out two or three battens the rest can be spaced about half an inch apart. This prevents the chickens from packing too closely together and allows more air between them. After another few days the space between the battens can be increased a little, care being taken that the chickens cannot get down between them. A sloping board is placed along the front of the battened platform to prevent the chickens getting underneath. In a week or so the regular perches should be placed in position and the chickens will gradually take to them, after which the battens can be removed and kept for use with the next lots.

In the cold weather, or if chickens have to be put out of the brooders before they are six weeks old, they should be made cosy by having a cover

board about 4 feet x 3 feet to lean against the wall for them to get under, but it should not be placed close to the side wall as this would cause the chickens to crowd into the corner. Another method is to make a bag canopy about 15 inches high for the chickens to go under, leaving a good space at both sides for the free circulation of air underneath. The type of houses described will be found greatly to facilitate the handling of chickens, and will obviate losses after the brooding stage, provided they are not removed from the brooders while too young and are healthy when transferred.

Saving Stud Cockerels.

Where cockerels will be required for breeding purposes next season, they should be reserved out of the batches of chickens hatched before September so that they will be at least ten months old by the next breeding season. The mistake is often made of marketing the early cockerels when prices are high and depending upon the later ones for stud purposes. This results in having some immature and poorly developed birds to select from.

Another matter which should be kept in mind is that about three times the number of birds that are ultimately required should be retained to choose from, because many of the cockerels that at first appear promising will develop faults as they grow older and will thus have to be rejected. Failure to retain sufficient cockerels is one of the reasons why some farmers have to resort to very inferior males for the breeding pens. It should be realised that the male bird plays a very important part in the quality of the progeny, not only from the breed standard point of view, but also in the maintenance and improvement of egg production. Therefore careful selection of the male is an essential factor in breeding.

A mistake often made by beginners is to reserve for breeders the precocious type of cockerels, which at an early age look "showy" and full of vigour. This type matures too quickly and the birds do not develop sufficiently to make satisfactory breeders. The right birds to retain are those which make good body development, but do not reach the mature stage so quickly. Distinction has, of course, to be made between the well-grown birds referred to and the slow-growing, late-hatched ones, which are too long reaching maturity to be of any use.

Market Cockerels.

On numerous farms the cockerel portion of the chickens hatched are looked upon as a waste product, as it were, of the rearing season, and they are disposed of as soon as possible at very low prices. This results not only in economic loss, but also deprives the public of a valuable item of food. The argument that it does not pay to rear cockerels to a suitable age for market only holds good in cases where the area of land does not permit of their being reared without causing congestion among the pullets, or on farms just starting, where it has not been possible to provide adequate equipment for rearing.

To visit the markets at this time of the year and see the hundreds of undersized chickens penned for sale should convince anyone of the necessity for more businesslike handling of this product by the farmer. That these potentially good table birds are sacrificed for next to nothing is deplorable, and it is time that this aspect of poultry-farming was given more careful consideration. The fact is that given good plain food and satisfactory accommodation, cockerels can be made to pay for rearing to a proper marketable age. Where good range can be provided, the cockerels keep clean and fresh and can be marketed straight from the runs without going through any fattening process, which, unless carried out properly, is of no advantage.

An essential in the successful marketing of table birds is to watch the market and send in the class that is in demand. If the majority of poultry-farmers would study this aspect of their business more, and market their birds only when they were ready, a greater demand would soon follow with consequent higher prices. As matters are at present the rubbish which is poured into market kills the demand and brings down prices all round; whereas if good birds were available in regular supply, more would be placed in storage and thus the gluts would be relieved. The reason that little storage is done at present is because suitable birds are not available.

White Maize Competition, 1929-30.

The Department of Agriculture has again decided to co-operate with local agricultural societies, the Royal Agricultural Society, and Messrs. Kellogg (Australia) Proprietary Ltd., in the carrying out of maize competitions on the same lines as last year's contests.

Messrs. Kellogg (Aust.) Pty. Ltd. have again donated a substantial sum for prize money, amounting this year to £150, or £30 to be divided among the first, second, and third prize winners in each of the five districts into which the State has been divided.

The judging will be undertaken by the Department's district agricultural instructors, and will be carried out at the same time and in conjunction with the field maize competitions conducted by the local agricultural societies in co-operation with the Royal Agricultural Society. The crops entered may be inspected twice by the judge, and points will be awarded for (*a*) germination and stand, (*b*) cultivation methods and weed control, (*c*) condition, appearance, evenness, &c., of the crop, (*d*) freedom from insect pests and disease, (*e*) purity and trueness to type, (*f*) estimated yield, and (*g*) suitability of maize for manufacturing purposes. Messrs. Kellogg (Aust.) Pty. Ltd. will allot the points under section (*g*).

Entries close with the local agricultural societies, and must be made within two months after time of sowing or germination of the crops. In the event of any local society not conducting a competition, individual farmers will be permitted to submit an entry through their district society. Entry forms and detailed particulars can be obtained from the agricultural societies in the districts affected.

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VOL. XL. PART 11. NOVEMBER 1, 1929.

Agricultural Gazette of New South Wales.

Farm Forestry.

V. THE NATIVE AND INTRODUCED TREES OF NEW SOUTH WALES.

[Continued from page 748.]

R. H. ANDERSON, B.Sc. Agr., Assistant Botanist, Botanic Gardens, Sydney, and Lecturer in Forestry, University of Sydney.

THE TABLELAND DIVISION—*continued.*

BOXES.

THESE do not constitute a very important element in the Tableland flora, being more prominent in the Slopes and Coastal Divisions. The species occurring, however, are fairly valuable.

RED BOX (*Eucalyptus polyanthemos*).

A small to medium-sized tree with rather heavy foliage, the rough bark often extending only a few feet up the trunk.

It occurs both in the central and southern subdivisions, mainly at lower elevations on the western side, and shows a decided preference for sedimentary formations, being generally on fairly heavy but poor soils on slopes and ridges.

Uses.—The reddish timber is strong, rather difficult to split, and is generally regarded as very durable in the ground. The trunk, however, is frequently very short, making it difficult to obtain good length logs, and some trees are gnarled and pipy. Nevertheless, the timber should be regarded as a fairly valuable one for fencing and for most purposes requiring strength and durability. It makes a fairly useful shade and shelter tree.

COASTAL WHITE BOX (*Eucalyptus quadrangulata*).

(Also known as Black Box and occasionally as Brush Box on the South Coast.)

A medium to large-sized tree with a long, straight, clean bole, usually found on deep, moist, loamy soils in brush areas of the southern and central coastal subdivisions. It finds its way up to the Tableland Division by valleys or gorges on the eastern side, particularly on the Moss Vale plateau.

Uses.—The timber is pale-coloured and said to be very strong. It should be useful wherever strong heavy timber is required.

Other boxes which are found in the Tableland Division, but which have already been dealt with in the Western Slopes Division, include—

YELLOW BOX (*Eucalyptus melliodora*).
FUZZY BOX (*Eucalyptus conica*).
WHITE BOX (*Eucalyptus albens*).

Eucalyptus melliodora is fairly common chiefly in the lower elevations of all the Tableland subdivisions, and is regarded as a very useful tree.

Eucalyptus conica is found on the lower western elevations of the northern subdivision, and in a few localities in the central subdivision.

Eucalyptus albens is found in several western localities at lower elevations than in the northern subdivision, but is practically confined to the Slopes Division.

Bosisto's Box, also known as Red Box (*Eucalyptus Bosistoana*).

Ascends a little from the Coastal Division on the eastern side, making its best development on limestone formation.

Caley's Ironbark or Mountain Ironbark (*Eucalyptus Caleyi*).

IRONBARKS.

Species of ironbark do not form a prominent feature of the Tableland flora, as such species usually prefer lower elevations.

Caley's Ironbark (*Eucalyptus Caleyi*), also known as Silver-leaved Ironbark, Mountain Ironbark, Drooping Ironbark, Broad-leaved Ironbark, ascends to higher elevations than other ironbarks, and is a fairly conspicuous tree, owing to its drooping, rather silvery foliage. It reaches a

moderate size and is fairly common in the northern subdivision, particularly on the western side. The deep red timber is locally valued as a good and durable wood, and makes excellent fuel.

NARROW-LEAF IRONBARK (*Eucalyptus crebra*) is found in the northern subdivision at lower elevations, and Mugga (*Eucalyptus sideroxylon*) is occasionally found in the same subdivision, although generally below 2,000 feet.

STRINGYBARKS.

Stringybarks form a fairly important part of the Tableland flora, and generally yield a timber of good quality. The botany of this group, however, has not yet been thoroughly worked out, and the exact definition and limitations of the individual species are still rather vague. This is particularly the case with those species in the northern subdivision.

BLUE-LEAVED STRINGYBARK (*Eucalyptus agglomerata*).

A medium-sized to fairly large tree of good shape found on sedimentary soils on the lower eastern portions of the central and southern subdivisions. The whole tree has a fairly pronounced peppermint-like odour,

Uses.—The timber is pale brown or reddish, and is much valued locally, having a great reputation for durability. It is used largely for weatherboards, general building purposes, and fencing. A good tree for planting for the above purposes on suitable soils.

BLAXLAND'S STRINGYBARK (*Eucalyptus Blaxlandi*), or occasionally MESSMATE.

A medium-sized tree found in the central subdivision, especially the Blue Mountains district. The bark is not a typical stringy one, being often rather more peppermint-like. The upper branches are generally smooth and sometimes ribbony.

Uses.—The timber is light brownish and fissile, and appears to be of good quality. It should be suitable for general building purposes, and for fencing.

WHITE STRINGYBARK (*Eucalyptus eugenioides*).

This is a medium-sized to fairly large tree which occurs fairly freely in the coastal subdivision and extends to the Tablelands in the central subdivision. It is recorded also from the northern subdivision, but most of these trees appear to vary from the typical form and may possibly be a distinct species. It is usually found on the poorer classes of soils from sandstone, granite or shale.

Uses.—The timber is generally regarded as both useful and durable, and is suitable for building, fencing, and fuel.

Eucalyptus laevopinea and the variety *minor*.

A fairly big proportion of the stringybarks occurring in the northern subdivision and, to some extent, in the central subdivision are at present grouped under this species or its variety, but the exact limitations of these are not yet conclusively worked out.

BASTARD STRINGYBARK (*Eucalyptus Laseroni*).

A small to medium-sized tree found only on the high, cold areas of New England, frequently on marshy ground. It is thought that this species is possibly a hybrid between *Eucalyptus stellulata* and a stringybark. The timber is yellowish-brown, rather gum-veined, and does not appear to be of much value.

Other stringybarks found in the Tableland Division include:

Red Stringybark (*Eucalyptus macrorrhyncha*), which occurs on the lower elevation of the western side of the Division, where it makes its way up from the Western Slopes (see Western Slopes Division for full description).

Yellow Stringybark (*Eucalyptus Muelleriana*), a coastal species, is found in a few localities on the lower eastern portion of the Division.

MISCELLANEOUS EUCALYPTS.

Under this heading are grouped the various species which do not altogether conform to any of the groups previously dealt with. Several of the species are of importance in this Division.

CAMDEN WOOLLYBUTT (*Eucalyptus Macarthuri*).

An umbrageous tree with dark-green foliage found mainly in the Moss Vale-Bowral-Mittagong district in the central subdivision, but extending a little into the southern subdivision. It is also found in the Jenolan Caves area. It grows chiefly on flats liable to flooding or near streams, and prefers shaly soil of fairly good depth. The bark is rough and somewhat box-like, but very woolly; the upper branches are smooth.

Uses:—It makes a very fine shade and shelter tree, and is distinctly ornamental, being probably the most useful tree of this class for rather heavy moist soils in the Tableland Division. The leaves yield a rather exceptional oil, in that it consists largely of geranyl acetate and free geraniol, which is of value for perfumery purposes. It is one of the few eucalypts which has been cultivated in plantations for its oil content. The timber is pale coloured, does not split well, is not durable, and is generally regarded as of poor quality.

MOUNTAIN ASH OR GUM-TOPPED STRINGYBARK (*Eucalyptus gigantea*).

A large tree with good straight bole found in the western mountain district of the southern subdivision. For approximately half-way up the trunk the bark is fibrous and resembles a stringybark. The upper portion and branches are generally smooth. It is found on both granitic and basaltic soils.

Uses.—The pale-coloured timber is a very valuable one, being very light in weight for a eucalypt, and is fissile and easily worked. It is a good bending timber, takes nails well, and is useful for building purposes, case-making and furniture work. It is not regarded as durable in the ground. The tree coppices rather feebly, but reproduces itself abundantly from seed,

and is an excellent tree for planting on moderately deep moist soils at fairly high elevations, both for its timber and to a lesser extent as a shelter and ornamental tree. The large leaves are often slightly ashy-hued, and have a fine aroma.

MOUNTAIN ASH *(Eucalyptus Sieberiana).*

A small to large-sized tree, the bark in young specimens somewhat resembling a stringybark, but in older trees it is deeply furrowed and rugged, resembling that of an ironbark in general appearance. The ultimate branches are smooth-barked and often blue or purplish in colour. This species is universally known as Mountain Ash, although the timber is not altogether of the Ash class, and should be distinguished from *Eucalyptus*

Mountain Ash (*Eucalyptus gigantea*).

gigantea, which is also known by the same vernacular name. For this reason it would, perhaps, be better to refer to it as Blue Mountain Mountain Ash, as it is very common in that subdivision, although extending to other districts. It occurs mainly in the central subdivision of the Tablelands, to some extent in the southern subdivision, chiefly on the eastern slopes, and is fairly common in the southern and central portions of the Coastal Division.

It is usually found on poor soils on rocky or stony ridges, although extending to better and deeper soils. In many districts it appears to prefer the southern aspect of rather barren slopes.

Uses.—The timber is pale coloured, moderately heavy and very strong and tough, hardly fissile, although fairly easily sawn. It is useful for any purpose requiring strength or toughness combined with moderate weight as, for example, axe or pick handles and shafts of vehicles. It has been suggested as an excellent substitute for imported hickory. The timber is generally regarded as not durable in the ground or in very exposed situations.

Cut Tail (*Eucalyptus fastigata*).

(Also known as Black Mountain Ash in Federal Territory, Silver or White Top Woollybutt, Messmate, Blackbutt.)

A medium-sized to large tree, the trunk and varying portion of the branches covered with a brown, fibrous, almost stringy bark, the upper branches smooth. It is found both in the southern and central subdivisions on areas enjoying a moderately good rainfall. It occurs on loamy granitic or red basaltic soils, but avoids the Hawkesbury sandstone and Wianamatta shale series.

Uses.—The timber is moderately light and open grained, splits fairly easily and is suitable for building purposes, etc. It can also be used for case-making, but is rather heavy for this purpose.

Black Gum (*Eucalyptus aggregata*).

(Also known as Peppermint, Woollybutt, Sally, Messmate, Flooded Gum.)

A small, rather umbrageous tree with a rough bark, midway in texture between a flaky and stringy bark, extending almost to the tips of the branches. It occurs in the central and southern subdivisions, and is always found in damp situations near streams or on alluvial flats.

Uses.—The pale coloured timber is regarded as of little value, and the tree is usually not of timber-producing size. It makes a fairly effective shade and shelter tree, and is perhaps worthy of cultivation in cold damp soil for this purpose. Occasionally cattle are reported to eat the leaves.

The remaining Eucalypts in this Division include the following species:—

Apple (*Eucalyptus Stuartiana*) and Apple or Mountain Apple (*Eucalyptus elaeophora*), which are fairly widely distributed throughout the subdivisions. (See Western Slopes Division for full description.)

Tenterfield Woollybutt (*Eucalyptus Banksii*) occurs as a rather straggly but fairly shady tree on granitic hillsides in the moister parts of the northern subdivision. It is of no particular value.

Bloodwood (*Eucalyptus corymbosa*) and Red Mahogany (*Eucalyptus resinifera*) ascend from the Coastal Division at lower elevations.

Eucalyptus dealbata comes up a little from the Western Slopes Division on the western side of the Tablelands.

Eucalyptus parvifolia is only known from a small area on the Southern Tablelands at Nimmitabel, and is a small shady tree moderately useful as a shelter tree in bleak situations.

Eucalyptus Moorei, Eucalyptus pulverulenta and *Eucalyptus Bauerlenii* are shrubby or very small trees of no particular merit.

ACACIAS.

The Acacias of the Tableland Division include a species furnishing a very fine cabinet timber, and another species regarded as one of the most valuable sources of tanning bark in the world. A number of the species do not attain tree size, and are of little importance. All the species dealt with are readily propagated from seed.

Blackwood (*Acacia melanoxylon*).

(Also known as Hickory or occasionally Mudgerabah in New England.)

A fine tree with dense foliage mainly found in the southern and northern subdivisions, but occasionally in the central, as, for example, on the western side of the Blue Mountains. In southern localities it is a tall tree up to 90 or 100 feet in height in favoured spots, but in the north it rarely exceeds 50 feet, although a fine, shady, well-formed tree. On the Monaro it is found on stony basalt ridges and hills, but is dwarfed and somewhat gnarled. For its best development it requires a moist, fairly rich soil with a certain amount of shelter.

"Phyllodes (leaves) 3 to 4 inches long, rather obtuse, much narrowed at the base. Pods flat, fairly broad, often curved in a circle. Flower heads in short axillary racemes."

Uses.—The timber ranks among the best of our ornamental woods. It is brownish in colour, streaked with paler shades, and frequently has a beautiful figure. It is strong, hard, close-grained, bends well, and is useful for cabinet work generally, panelling, carriage-building, and a number of other purposes. The tree is also regarded as very useful for shade and shelter, especially in the northern subdivision, and is frequently left standing for this purpose. The bark is not regarded as a good source of tanning material.

Hickory (*Acacia implexa*).

This species closely resembles the preceding one, and is frequently confused with it. The phyllodes, however, are more pointed, and if ripe pods are available it will be found that the funicle (the stalk or cord by which the seed is attached to the pod) of *Acacia melanoxylon* is red and carried round the seed in a double fold, whereas that of *Acacia implexa* is paler and folded under the seed. The latter species is a small to medium-sized tree scattered through both Coastal and Tableland Divisions, and extending in a few places in the north to Western Slopes localities. It is often found on igneous hills.

Uses.—The timber is hard, close-grained, dark-brown with pale stripes, resembling that of *Acacia melanoxylon* to some extent. It can be used for furniture-making, turnery work, and as a fuel. The tree is moderately useful for shelter purposes, and cattle are said to eat the leaves to some extent.

CEDAR WATTLE (*Acacia elata*).

A small to medium-sized tree, occasionally reaching 60 feet in height, found in the central subdivision in gullies and along watercourses in the Blue Mountains and Moss Vale-Mittagong districts.

"Leaves pinnate, somewhat resembling the common Pepper Tree; the leaflets 1 to 2 inches long. Pod linear, straight, flat, about ½-inch broad. Flower heads in axillary racemes, the upper ones forming a terminal panicle."

Uses.—This is one of the most ornamental of the wattles, the foliage being particularly attractive. It is quick-growing and useful for shade, shelter, and breakwinds. The timber is pale-coloured, soft and perishable, but may have its uses for case-making.

GREEN WATTLE (*Acacia mollissima*).

A small to medium-sized tree found in the central and southern subdivisions on moderately good and moist soil, but will do fairly well on poorer, drier sites. It flowers mainly in the summer and is very sweet-scented. Both this species and *Acacia decurrens* are known variously as "Black" or "Green Wattle," although perhaps "Green Wattle" is more generally applied to *Acacia mollissima* and "Black Wattle" to *Acacia decurrens*.

"Foliage bipinnate (feather-leaved), softly pubescent, the young shoots tinged with golden yellow. Leaflets short and broad. Glands (seen as small protuberances on the rhachis) numerous. Pod flat, rather narrow and constricted between the seed."

Uses.—This species provides one of the most valuable tanning barks in the world. In South Africa plantations covering over 300,000 acres have been made, but Australian supplies are obtained almost entirely from naturally-occurring trees. It is a most useful species for planting in suitable districts as a profitable sideline. The timber is light, fairly tough and strong, but regarded as inferior for most purposes.

BLACK WATTLE (*Acacia decurrens*).

A small to medium-sized tree found in the southern and central Coastal Divisions and extending up the Tablelands to some extent. It belongs to the bipinnate (feather-leaved) group of acacias, but is distinguished from *Acacia mollissima* by the leaflets being much longer and narrower and more scattered along the rhachis than in that species. The foliage is also glabrous, or only slightly pubescent. Generally speaking, it flowers during the winter months as compared to the summer flowering of *Acacia mollissima*.

Uses.—The bark contains a fairly high percentage of tannin and is a useful source of material. The tree is fairly ornamental and is moderately useful for shelter, but will only make indifferent growth in poor soil. The timber may be used for fuel.

Two varieties are included under *Acacia decurrens*, viz., var. *pauciglandulosa* and var. *Leichhardtii*, both of which are known as "Green Wattles."

The variety *pauciglandulosa* is pubescent, with a yellowish tinge to the young shoots, approaching more closely to *Acacia mollissima* in this respect. As the varietal name indicates, it has very few glands on the rhachis. It occurs in the northern subdivision of both Coast and Tableland.

Black Wattle (*Acacia decurrens*).

The variety *Leichhardtii* resembles the above variety in general appearance, but differs in that it has a profusion of long weak hairs, especially on the rhachis. It is of no particular importance.

Silver Wattle (*Acacia dealbata.*)

A small to medium-sized tree found scattered through the Tableland Division, but usually in the southern portion and generally at higher elevations than *Acacia mollissima* and *Acacia decurrens*. It belongs to the bipinnate (feather-leaved) group, but can be distinguished from allied species by the more or less silvery or ashy hue of the foliage and young branches.

Uses.—It is an ornamental species and moderately useful for shelter. On the Riviera in Southern Europe it is largely grown for decorative purposes, being the principal wattle used. It is regarded as inferior to *Acacia mollissima* and *Acacia decurrens* as a source of tanning bark, but there is a possibility that the wood could be utilised for paper pulp. Otherwise the timber is only suitable for rustic work and fuel. It is frequently a difficult species to eradicate when clearing, as it suckers very freely.

MOUNTAIN HICKORY (*Acacia penninervis*).

(Also occasionally Black Wattle.)

A shrub or small tree, occasionally reaching medium size, found in a variety of situations, including high stony ridges, throughout the Tableland Division, and passing to some extent down the Western Slopes.

"Phyllodes one-veined, penninerved, lanceolate. Flower heads in axillary racemes. Pod broad."

Uses.—The timber appears to be tough and durable, bends fairly well, and is perhaps suitable for tool handles, &c. A fair shelter tree when well grown.

BROAD-LEAF HICKORY (*Acacia falciformis*).

A small to medium-sized tree, often densely foliaged, and with a rather thick bark. It is fairly widely distributed from north to south of the Tableland Division, as well as on the coast. It resembles *Acacia penninervis* somewhat, but is usually a larger tree with broader, coarser, more falcate phyllodes.

Uses.—A useful shade and shelter tree. The bark is rich in tannic acid, and appears to be almost as good in this respect as the more favoured *Acacia pycnantha*. The timber resembles that of *Acacia penninervis.*

Other Acacias in the Tableland Division include the following species:—

Red-leaved Wattle (*Acacia rubida*), a shrub or small tree scattered throughout the Division, but mainly in the southern and central subdivisions, and often on rocky ridges and hillsides. It is distinguished by the reddish-brown colour of the foliage, and it is common to find both true leaves and phyllode present on the one plant.

Sydney Golden Wattle (*Acacia longifolia*) is typically a coastal tree, but is not uncommon in many parts of the Tablelands.

Fringed Wattle (*Acacia fimbriata*) is a beautiful shrub found in the northern subdivision, and makes its best development on rich alluvial soil, although not confined to such areas.

Acacia neriifolia, Acacia hakeoides, Acacia decora, and *Acacia spectabilis,* all of which have been more fully described in the Western Slopes Division, are found to some extent on the Tablelands, *Acacia neriifolia* being fairly common on some of the granitic areas of New England.

(*To be continued.*)

Maize Experiments on the Far South Coast.

FARMERS' EXPERIMENT PLOTS, 1928-29.

JOHN L GREEN, H.D.A., Agricultural Instructor.

IN view of the insufficiency of data on which to base recommendations as to varieties and fertiliser requirements of maize on the Far South Coast, it was decided last season to commence a series of variety and manurial experiments.

The following farmers conducted trials in co-operation with the Department during the past season:—

L. D. Collett, Terrimbee, Moruya.
P. Hoolahan, Shannon View, Moruya.
H. J. Bate, Durham Farm, Bodalla.
N. S. Bate, Old Bodalla, Bodalla.
H. F. Sawtell, Norira, Cobargo.
J. H. Tarlinton, Woodburn, Cobargo.
J. B. D'Arcy, Warragaburra, Bega.
W. J. Hergenhan, Doctors Creek, Bega.
Guthrey Bros., Elmgrove, Bega.
C. N. Squire, Springvale, via Bega.
T. E. W. Irwin, Erinna, Stoney Creek.
G. Black, Sam's Corner, Bemboka.
T. J. Kelly, Glengarry, Tanja.
J. A. Martin, Woodlands, Pambula.
H. Cole, Rosehill, Pambula.
W. R. Mitchell, Roseneath Farm, Lower Towamba.
R. J. Goward, Kiah, via Eden.

Unfortunately, owing to the dry spring it was not possible to sow a number of other trials arranged—mainly on the hill country—and of the trials sown, those with Messrs. H. J. Bate, N. S. Bate, H. F. Sawtell, C. N. Squire, T. E. W. Irwin, and G. Black were failures owing to the drought.

The Season.

Never before has such a bad spring and early summer been experienced in this district. The rainfall for the seven months' period, July to February, was extremely low, averaging about 3½ inches throughout the district. In addition, strong winds were in evidence right through the spring, which further dried out the soil. Under these conditions the value of winter ploughing was greatly in evidence; the few farmers who ploughed after the June rains were able to sow opportunely and obtained a good germination. Experiments in other parts of the State have shown 24 per cent. increase in yield where the land has had a short fallow and two ploughings, and similar results would be obtained in this district. From February onwards ideal conditions prevailed, but in the majority of cases they did not counteract the effect of the bad spring.

The rainfall at a number of centres during the fallow and growing periods was as follows :—

RAINFALL TABLE.

	Moruya.	Bodalla.	Cobargo.	Bega.	Bemboka.	Pambula.	Towamba.
	Points.	Points.	Points.	Points.	Points.	Points.	Points.
June ...	606	651	687	1,310	832	937	580
July ...	135	105	76	15	62	51	49
August ...	58	43	30	20	0	28	27
September ...	6	28	29	90	43	84	94
October ...	73	41	80	111	42	118	143
November ...	21	25	34	52	10	231	97
December ...	103	45	33	42	116	119	45
January ...	102	66	66	37	32	50	27
February ...	1,935	1,473	1,632	1,093	1,696	1,240	2,336
March ...	242	262	193	241	153	127	109
April ...	461	460	380	375	293	490	220
May ...	67	55	124	83	48	122	209

The Plots.

Moruya (L. D. Collett).—Soil alluvial loam, previously cropped continuously with maize; ploughed once only, on 17th September, and rolled. Sown on 1st October with single-row dropper, in rows 45 inches apart, three grains every 33 inches, which is equal to 12 lb. per acre. Variety for manurial trial—Funk's Yellow Dent.

Moruya (P. Hoolahan).—Soil, rich black loam, not cropped since 1924; ploughed 3rd September, disced, harrowed and rolled many times; second ploughing 29th September, harrowed and rolled. Sown on 2nd October with single-row dropper in rows 48 inches apart, three grains every 28 inches, equal to 12 lb. per acre. Germination was only fair, but by sound cultivation of the growing crop fair yields were obtained.

Cobargo (J. H. Tarlinton).—Soil, light clayey loam, typical of hills around Cobargo; previously pasture until 1927, then maize for one season. Disc-ploughed 28th August, harrowed, and disc-harrowed on 10th October. Sown with single-row dropper on 26th October in rows 42 inches apart, one or two grains every 14 inches, equal to 14 lb. per acre. No results were obtained from the variety trial, but the manurial trial, sown with Funk's Yellow Dent, gave striking (though light) yields, for the dry season. The manured rows were 18 inches taller than the unmanured, and disproved the assertion that superphosphate is of no value on poor land in a dry season.

Bega (W. J. Hergenhan).—Soil alluvial loam; previously cropped with maize for many years. Heavy tramping with stock interfered with the preparation of the land, and the resultant yields. Mr. Hergenhan did not take over the paddock until September, so that it was not possible to give it the thorough working desired. The land was ploughed twice, but was too hard to enable the preparation of a good seed-bed. Sown on 14th November with single-row dropper in shallow furrows, rows 42 inches apart,

one or two grains every 14 inches, equal to 14 lb. per acre. By sowing in shallow furrows a much better germination was obtained than by sowing on the surface. The variety for manurial trial was Funk's Yellow Dent.

Bega (Guthrey Bros.).—Soil, alluvial loam; cropped with maize for many years; mouldboard ploughed in June 10 inches deep, rolled and harrowed; given a second ploughing in late September and rolled. Sown with double-row dropper on 15th October in rows 42 inches apart, one or two grains every 15 inches, equal to 16 lb. per acre. The variety for manurial trial was Funk's Yellow Dent.

Bega (J. D'Arcy).—Soil, heavy alluvial loam; previously cropped with maize for many years; stalks cut and burnt on 28th August; disc-ploughed 10 inches deep on 28th August; harrowed and rolled 31st August; cultivated 9th September, and deeply cross-cultivated 4th October. Sown on 17th October with single-row dropper in rows 36 inches apart, single grains every 10 inches, equal to 20 lb. per acre. This sowing was rather heavy, but frequent harrowings of the young crop, coupled with a dry season, gave a good average stand; the variety was Funk's Yellow Dent.

Tanja (T. J. Kelly).—Soil, alluvial loam; under lucerne to 1927, maize 1927-28; disc-ploughed 20th August, well worked, and reploughed on 16th October, and harrowed. Sown with single-row dropper on 16th October in rows 48 inches apart, two grains every 16 inches, equal to 14 lb. per acre.

Pambula (H. Cole).—Soil, alluvial loam; pasture to 1925, and maize since; mouldboard-ploughed 1st October, cultivated and disced twice. Seed hoed-in in rows 36 inches apart each way, three grains per hill, equal to 14 lb. per acre. This trial suffered from three floodings, which reduced the yields.

Pambula (J. A. Martin).—Soil, alluvial loam; lucerne to 1927, maize 1927-28; mouldboard ploughed 15th July, second ploughing 26th September, and well worked until sowing on 30th October with single-row dropper in rows 42 inches apart, three grains every 32 inches, equal to 15 lb. per acre.

Kiah (R. J. Goward).—Soil, alluvial loam; continuously cropped with maize for many years; mouldboard-ploughed 18th September, rolled and harrowed twice prior to sowing. Sown on 12th October with double-row dropper, using chain to space hills 36 inches apart each way. This permits of cross-cultivation, and is a method to be highly commended; the time required to sow is no longer than with an ordinary double-row machine, and hoe work is practically eliminated. Manurial trial sown with Funk's Yellow Dent.

Lower Towamba (W. R. Mitchell).—Soil, alluvial loam; continuously cropped with maize. Ploughed 10th September, rolled and harrowed many times. Sown on 11th October with single-row dropper in rows 42 inches apart, two grains every 20 inches, equal to 13 lb. per acre. Manurial trial sown with Funk's Yellow Dent.

Superphosphate was applied to all variety trials at 2 cwt. per acre. In many cases this was done by hand, as no manure attachment was on the

drill. This method, when adopted with manurial trials, does not give the best results, particularly as regards a hastened early growth of the young plants.

YIELDS of Maize Variety Trials.

Variety.	Moruya (L. D. Collett).	Moruya (P. Hoolahan.)	Lower Towamba. (W. R. Mitchell).	Kiah (R. J. Goward).	Bega. (Guthrey Bros.).	Bega (W. J. Hergenhan)	Tanja (T. J. Kelly).	Pambula (H. Cole).	Pambula (J. A. Martin).
	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.
Funk's Yellow Dent	86	53	119	118	43	80	29	50	24
Boone County White...	84	48	114	136	66	76	52	54	40
Fitzroy	87	53	70	80	64	54	48	34	...
Golden Beauty ...	82	48	95	90	43	40	25	36	40
Large Red Hogan ...	99	79	105	91	62	82	52	50	...
Hickory King... ...	80	46	64	83	54	60	38	54	33
Yellow Hogan ...	94	60	...	96	50	73	41	49	37
Leaming	...	50	100	110	...	75	...	44	55
Bega Yellow	96	60	103	...	...	...	25	51	30
Large Goldmine ...	48	44	...	...	...	41	...	44	26
Pride of Hawkesbury	...	...	95	65	60	84	...	...	...
Iowa Goldmine ...	...	...	...	...	...	...	...	48	16
Early Goldmine ...	65	...	...	...	...	...	...	...	...
Abercrombie	62	...	...	...	...	...	29	58	56
Manning Silvermine ...	...	...	102	...	...	...	...	...	...
Iowa Silvermine ...	...	...	...	...	...	...	...	50	...
Rumski	...	...	...	...	...	...	...	...	27
Farmer's Golden Beauty.	...	...	91	...	...	...	...	...	...
Farmer's Giant White	...	...	...	97	...	...	...	...	...
Farmer's Hickory King	...	...	...	...	...	...	40	...	...
Farmer's Funk's Yellow Dent.	...	...	...	...	...	...	...	...	24

YIELDS of Maize Manurial Trials.

Manure per Acre.	Moruya (L. D. Collett).	Lower Towamba (W. R. Mitchell)	Kiah (R. J. Goward).	Bega (Guthrey Bros.).	Bega (W. J. Hergenhan)	Bega (J. D'Arcy).	Cobargo (J. H. Tarlinton.)
	bus.	bus.	bus.	bus.	bus.	bus.	bus.
Superphosphate—2 cwt.	82	97	101	50	84	87	22
Superphosphate—4 cwt.	...	94	100	57	79	...	26
*Mixture No. 1—2 cwt.	86	...	101	62	85	96	20
†Mixture No. 2—2 cwt.	83	...	124	70	67	79	23
Basic superphosphate—2 cwt. ...	...	91	...	...	...	...	...
‡M 22—2 cwt.	...	...	...	...	...	84	...
No manure	79	96	92	44	78	84	7

* Mixture No. 1 consists of 5 parts superphosphate and 1 part nitrate of soda.
† Mixture No. 2 consists of 5 parts superphosphate and 1 part sulphate of potash.
‡ M 22 consists of equal parts of superphosphate and bonedust.

Comments.

Recommendations as a result of only one season's trials are not advisable, but, speaking generally, and in the light of the performances elsewhere of some of the varieties tried, very informative data are available. In this district there are five distinct river flat areas, viz., Mullenderee and Kiora flats at Moruya; 15 miles south Bodalla flats at Bodalla; 60 miles farther south Bega, Brogo and Jellat flats at Bega; 23 miles again south Pambula flats at Pambula; and Kiah and Towamba flats 25 miles farther south near Eden. It is not reasonable to expect that the same varieties will suit all these areas, and a glance at the results of the variety trials will show that this is so. At Moruya, in both trials, Large Red Hogan topped the yields, Bega Yellow was next, and Yellow Hogan third; at Bodalla no results were obtained, although Large Red Hogan in one trial was the best variety. At Bega (including Tanja) Boone County White was top in two trials and fourth in one; Large Red Hogan was placed first, second, and third; Fitzroy second and third; and Funk's Yellow Dent third in one. At Pambula, Abercrombie (a Departmental cross-bred) was first in two, Boone County White was placed second and third, and Hickory King and Leaming each second in a trial. At Kiah and Towamba, Boone County White and Funk's Yellow Dent were the outstanding varieties.

The outstanding maize was Boone County White, which yielded so well when given good conditions, as at Kiah and Lower Towamba.

For hill country it is not possible to give any actual results, but the most promising varieties were Golden Beauty, Hickory King, and Funk's Yellow Dent.

Sorghum-Sudan Grass Hybrids—A Correction.

In the article on sorghum-sudan grass hybrids in last month's *Agricultural Gazette,* although it is stated on page 732 of that issue that the hybrids were tested for hydrocyanic acid content when between 12 and 18 inches high, readers will note that in column 3 of the table on page 735 the heights of hybrids 3 to 9 when cut are stated in feet instead of inches. The heights of hybrids 1 and 2 are correct as shown, *i.e.*, 4 feet in each case. In no case was the plant in flower when cut.

A School for Beekeepers.

A school for beekeepers will be held at Hawkesbury Agricultural College, Richmond, from 2nd to 17th January, 1930, inclusive. The course of instruction will include field demonstrations and lectures on the various aspects of apiculture.

Fee (including board and lodging for the full period) is £3 10s. Write to the Department of Agriculture for a copy of the prospectus.

Seed Maize Contests, 1928-29.

The Central Coast.

J. M. PITT, H.D.A., Senior Agricultural Instructor.

Of the nine maize plots sown in the Macleay, Upper and Central Manning districts in connection with seed maize contests, eight were completely spoilt by the disastrous February flood. Although partly submerged sufficient remained of the Mt. George plot to secure comparative yields.

Sown on a fertilised alluvial soil on 3rd September, 1928, the plot germinated unevenly owing to the dry nature of the soil, and the stand was further thinned by the devastating hailstorm that went through the Manning district in mid-October. The plot was ploughed out after this storm and was re-sown under more favourable conditions on 29th October, 1928. The land had previously grown maize for many years. It was ploughed twice and worked several times between July and September, the tilth, however, was not good, resulting in a patchy seed-bed (parts being drier than others).

There were seventeen entries, including seven of Fitzroy and three of Leaming. With one or two exceptions the samples of seed were good. Although dry conditions prevailed until February, satisfactory growth was made and the crop promised well. Then continual downpours of rain, floods, and gales partly spoilt the plot.

Fitzroy, as in the previous contest (1927-28), again filled the leading positions. The winning strain, entered by Mr. J. P. Mooney, Taree, yielded 93 bushels 18lb. per acre. Messrs D. Cameron's and R. Campbell's entries filled the minor positions with 90 and 89 bushels, respectively. Leaming came next in fourth and fifth positions. These two varieties are outstanding for the district. The plot average of 83½ bushels was good, considering the unfavourable season.

Yields in the Mt. George Seed Maize Contest.

	b.	lb.		b.	lb.
1. J. P. Mooney, Fitzroy	93	18	10. G. Levick, Palecap Horsetooth	81	42
2. D. Cameron, Fitzroy	90	32	11. J. P. Davis, Fitzroy	81	33
3. R. Campbell, Fitzroy	89	44	12. C. Shields, Golden Beauty ...	81	26
4. D. Cameron, Leaming	87	25	13. A. Andrews, Fitzroy	80	14
5. Duff and Andrews, Leaming ...	85	1	14. D. Dorward, Fitzroy	79	37
6. C. Shields, Pde. of Hawkesbury	84	30	15. A. Andrews, Leaming	79	12
7. R. Richardson, Golden Beauty...	84	8	16. J. Stitt, Pride of Hawkesbury ...	78	15
8. A. Andrews, Manning Pride ...	84	2	17. G. Levick, Large Red Hogan ...	74	30
9. F. Noris, Fitzroy...	83	39			

A new edition of *Farmers' Bulletin* 129, "The Beginner in Bee Culture," is available. Price 1s. 1d., including postage; obtainable from the Department of Agriculture, or from the Government Printer, Sydney.

Summer Fodder Trials on the Far South Coast.

FARMERS' EXPERIMENT PLOTS, 1928-29.

JOHN L. GREEN, H.D.A., Agricultural Instructor.

TRIALS of maize, sorghum and mangolds for summer fodder were carried out in co-operation with farmers at a number of centres during the season 1928-29.

The season was a very dry one, the rainfall for the spring and early summer being particularly low. Strong winds also contributed to the drying out of the soil.

A Fertiliser Trial with Maize.

A manurial trial with maize for green fodder was conducted with Mr. A. Louttit, of Moruya, on alluvial flood deposit, previously cropped with Red clover until 1927, and then to maize for silage. The plot was mouldboard ploughed 6 inches deep on 16th August: cultivated, harrowed and given a second ploughing (disc) on 1st October; harrowed and rolled. Sown 3rd October with single-row dropper in drills 36 inches apart, with three grains every 20 inches, which is equal to 16 lb. per acre. The variety was Fitzroy.

The following yields were obtained:—

Manure per acre.	Yields. tons	cwt.
Superphosphate, 2 cwt.	15	17
*Mixture No. 2, 2 cwt.	13	14
Superphosphate, 4 cwt.	13	3
†Mixture No. 1, 2 cwt	12	3
No manure	12	3

* Mixture No. 2 consists of 5 parts superphosphate and 1 part sulphate of potash.
† Mixture No. 1 consists of 5 parts superphosphate and 1 part nitrate of soda.

The Sorghum Trials.

Because sorghum is sown later in the season than maize, it was more difficult to obtain a germination with this crop owing to the dry conditions. Only two trials produced results; these were with—

P. Hoolahan, Shannon View, Moruya.
T. J. Kelly, Glengarry, Tanja.

The plot at Tanja was a variety trial. The soil is alluvial loam, and it was ploughed twice and well worked; sown with maize drill on 16th October in rows 36 inches apart, using 10 to 15 lb. seed per acre.

The results were unsatisfactory owing to a faulty germination, especially with White African.

The yields were as follows:—

Variety.	Yields. tons	cwt.
Saccaline	11	2
Sumac	8	16
White African	8	6
Collier	6	8
Cowper	5	4

Saccaline and White African were the best; the latter with a better germination would have outyielded Saccaline. It is not necessary to look past these two sorghums for one suitable for this district, and, of the two, White African, by virtue of its better keeping qualities, greater sweetness, and lesser susceptibility to red stain, should be given preference.

In the trial at Moruya, White African was used for a manurial experiment. The soil was an alluvial loam, but was not in too good order for germinating sorghum seed, although it had been well worked. The plot was sown on 2nd October with the single-row maize drill in rows 36 inches apart, using 6 lb. seed per acre.

The yields were as follows:—

Manure per acre.	Yield. tons	cwt.
2 cwt. Superphosphate	19	9
*2 cwt. Mixture No. 2	17	3
†2 cwt. Mixture No. 1	14	2
No manure	14	2

* No. 2 Mixture consists of 5 parts superphosphate and 1 part sulphate of potash.
† No. 1 Mixture consists of 5 parts superphosphate and 1 part nitrate of soda.

This trial, although showing the advantage of manure, was marred by an irregular germination. However, there was a decided increase in yield from the area treated with 2 cwt. superphosphate per acre.

A Mangold Trial.

A mangold variety trial was conducted in co-operation with Mr. T. J. Kelly, Glengarry, Tanja. The soil is a rich alluvial loam, and it was well prepared, and in excellent order for sowing, which took place on 2nd October, by hand, in drills 36 inches apart, with single seeds every 3 inches, and superphosphate at the rate of 2 cwt. per acre. The plot was harrowed to cover the seed after sowing. Germination was fair with Mammoth Long Red and Half Sugar White, but with the other varieties was very poor; Long Yellow failed to germinate.

The results were as follows:—

Variety.	Yield, tons.
Mammoth Long Red	88
Half Sugar White	78
Yellow Globe	58
Golden Tankard	44
Long Yellow	Nil.

It is well worth while for any farmer who has pigs to grow a small area, say, an acre, of mangolds. Certainly best results are obtained on rich flat land, but most better-class soils will give fair returns. One essential is to

have clean land, and to keep it clean while the crop is growing. Mangolds are a recognised crop in New Zealand, where yields of over 100 tons are obtained. Sowing may be carried out either in the autumn or spring, equally good returns being obtained in either season. Harvesting is easily performed by either turning the pigs in to graze or pulling the roots by hand and carting to the paddock.

In this trial mangolds of 45 lb. weight were obtained from Mammoth Long Red and Half Sugar White; in a better season they have been known to go over 70 lb. It will be seen that very few are required to fill a dray.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney, not later than the 12th of the month.

Maize—

Fitzroy ... Manager, Experiment Farm, Grafton.
Leaming ... Manager, Experiment Farm, Grafton.

Sorghum—

Collier ... Under Secretary, Dept. of Agriculture, Box 36A, G.P.O., Sydney.
Feterita ... Manager, Experiment Farm, Coonamble.
Under Secretary, Dept. of Agriculture, Box 36A, G.P.O., Sydney.

Saccaline ... Under Secretary, Dept. of Agriculture, Box 36A, G.P.O., Sydney,
Mr. A. S. Pankhurst, William Street, Singleton.

Sumac ... Manager, Experiment Farm, Bathurst.
Under Secretary, Dept. of Agriculture, Box 36A, G.P.O., Sydney.

White African Under Secretary, Dept. of Agriculture, Box 36A, G.P.O., Sydney.
Principal, Hawkesbury Agricultural College, Richmond.

Broom Millet—

Manager, Experiment Farm, Coonamble.

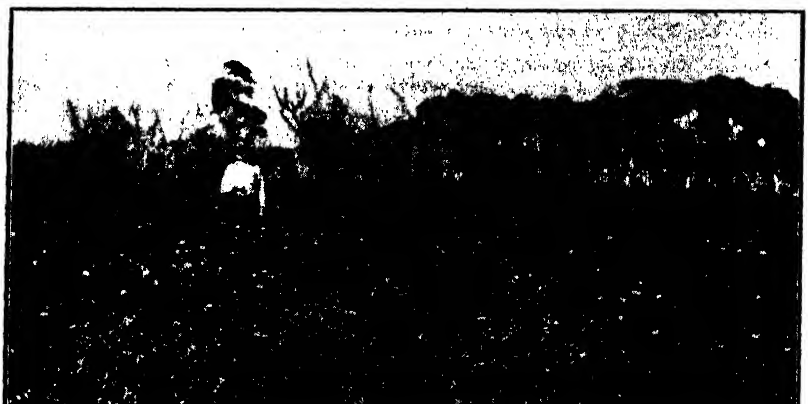
A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Southern District Potato Crop Competitions, 1928-29.

RESULTS OF LOCAL COMPETITIONS AND R.A.S. CHAMPIONSHIP

A. J. PINN, H.D.A., Special Agricultural Instructor.

DURING last season district potato crop competitions were carried out at Taralga, Crookwell, and Batlow. Owing to the droughty conditions which prevailed during the early part of the season a number of farmers withheld entries, but notwithstanding this fifty-five were received, as follows:— Taralga 8, Crookwell 26, Batlow 21. In conjunction with these district competitions, the Royal Agricultural Society organised a championship competition, for which it donated a silver cup trophy of the value of 10 guineas. The competitor scoring highest in each of the local competitions, provided he cultivated a minimum area of 5 acres of potatoes on his farm, was eligible to compete for the championship trophy.



Mr. D. Harries' Champion Crop of Factor.

The winner of the local competition at Batlow was not eligible to compete, owing to the area of potatoes on his farm being less than the prescribed 5 acres. Mr. J. Bryant, who secured second place, having the required area, became eligible to compete for the championship, the result of which was as follows:—

RESULTS of the R.A.S. Championship.

	Points.
1. D. Harries, Bannister.—Factor, 12 tons 6 cwt. per acre ..	116½
2. D. Wright, Taralga.—Factor, 9 tons 3 cwt. per acre ..	103¼
3. J. Bryant, West Batlow.—Factor, 8 tons per acre	97¼

An analysis of the points is given in the following table:—

Competitor.	Yield.	Freedom from Disease.		Quality.		Purity.	Allowance for previous cropping.	Total Points.
		Tops.	Tubers.	Appearance.	Cutting.			
D. Harries	61½	7	6	13	14	15	Nil.	116½
D. Wright	45¾	8	6½	13½	14½	15	Nil.	103¼
J. Bryant	40	8	6¼	14	14	15	Nil.	97¼

As forecasted in last year's report, several alterations in the scale of points for judging were made, and proved entirely satisfactory. The points awarded for yield are now calculated on a basis of 5 points per ton yield, in preference to the maximum of 40 points as previously awarded the highest yield in each local competition. An alteration was also effected in the allowance for previous cropping by limiting the period covered by such allowance to the preceding ten years.

The first inspection of the plots was made as near as possible to coincide with full flowering period. Owing to the peculiarities of the season the visits extended intermittently from 30th January until 12th March. During this inspection deductions were made on account of impurity and virus or wilt diseases, as indicated by the growth of the haulms. The digging of the plots was carried out during the period 7th to 25th May.

In each competition deductions on account of impurities and virus and wilt diseases were on a uniform basis, at the rate of 1 point for each 1 per cent. of impurity or infection, as the case may be. The deductions for disease in tubers were mainly on account of scab. The awards under the heading of quality were made for the most part from samples of tubers which were ranged alongside one another at time of judging. In view of the high price of potatoes this season, it was not possible to make deductions for quality to the extent possible in years of low price. On a comparative basis of 5 points per ton for yield, 1 point deduction for quality represented over £2 per ton in selling value.

During digging the effects of wilt disease could be seen in occasional plants, manifesting itself in the production of small tubers. It was pleasing to note, however, that many growers now realise the necessity of eliminating such progeny from their future seed supply. Trouble, however, is likely to continue in future plantings if seed is drawn from any portion of the crop lifted by contract diggers, unless these men are instructed not to pick up these tubers and can be relied upon to carry out their instructions.

Scab was, for the most part, absent, and it is many years since so little has been manifest in the crops. This was not due so much to remedial measures adopted by growers as to the weather conditions, which produced a quick growth of tubers in a moist soil.

The outstanding features of this year's competitions were the value of new land and the excellent results obtained from Factor variety.

The value of new land is largely due to its greater organic content. Under present cropping conditions soil is quickly depleted of this valuable constituent. The presence of decayed organic matter in potato soils is of paramount importance, as it provides a better moisture-holding capacity, which, in turn, allows of full benefit being obtained from artificial fertilisers. Such soils are also of a better texture, and consequently produce a tuber of good shape. Whilst it is not possible for potato growers to continue breaking up new land indefinitely, it is pleasing to note the greater attention being paid to the laying down of improved pastures, more particularly as applied to the use of clovers. It will, of course, be some years before such lands will be available for potato cultivation, but a number of competitors have this in view.

The variety Factor has certainly proved its drought-resisting qualities and likewise its high yielding capabilities. This variety is now the most popular in all three districts. Although white-skin varieties have in the past not been looked upon favourably by the city housewives, it is interesting to note that the demand in country centres is increasing yearly. When new crop potatoes are available the city buyers pay a premium for white potatoes, but until such time as the city prejudice against white potatoes during the main crop selling season is overcome it will be necessary to foster the growing of red-skin varieties. Owing to the success of the white-skins in the competitions, it seems very probable that unless prizes are awarded for best coloured skin and best white-skin, little improvement will take place in other than white-skin varieties. Local agricultural societies would do well to give consideration to this aspect of potato crop competitions in future years.

Crookwell District Competition.

This competition was carried out under the auspices of the Crookwell A.P. and H. Society. Of the twenty-six original entries, twenty-two remained in till the end, the bulk of which (fourteen plots) were situated in the vicinity of Bannister.

The remarkably high average yield of 6 tons 17 cwt. was secured in spite of the droughty conditions which existed during the summer months until mid-February. The rainfall registration at Bannister, taken at the public school, was as follows:—November 93 points, December 22, January 3, February 517, March 324. It will be noted that there were practically no useful falls of rain during December, January, or the first half of February. At Crookwell township the fall for January was 30 points, and for February 592 points. The main falls during that month were 18 points on 11th February, 230 on 12th February, 28 on 13th February, 34 on 14th February, 54 on 15th February, 64 on 16th February, 109 on 18th February, and 54 on 20th February.

There were eleven yields of over 7 tons per acre, nine of which were produced on new land. The organic matter (decaying grass, &c.) no doubt improved the moisture-holding capacity, and was particularly valuable in such a year as that experienced.

The purity standard was a big improvement on last year, as only two plots contained "strangers" to a greater extent than 1 per cent. Had it not been for the fact that few seed "sized" tubers were produced this year, additional sources of pure seed would have been available for other districts.

As indicating the large percentage of table potatoes in this year's crops, a typical instance can be quoted. One of the plots entered by Messrs. Lowe Bros. produced only 2 lb. of cull potatoes (half of which were very small tubers and the balance was attacked by grub) from 5 chains of a single row of potatoes. One hundredweight of the marketable potatoes contained only 8 lb. of "seed," ranging up to 3 oz. in weight.

The general appearance of the potatoes was exceedingly good, and except in a few instances there were no "stag-ends." The cutting quality was also good, the highest points in this direction being secured by Mr. McDonald's Factor and Mr. E. Nugent's Carman.

RESULTS of the Crookwell Potato Crop-growing Competition

Competitor.	Variety.	Yield.	Freedom from Disease.		Points for Yield.	Quality.		Purity.	Allowance for previous cropping.	Total Points.
		tons cwt.	Tops.	Tubers.		Appearance.	Cutting.			
D. Harries, Bannister ...	Factor	12 6	7	6	61½	13	14	15	Nil.	116½
O. Frost, Bannister	"	9 13	6	6½	48¼	14	14½	15	Nil.	104¼
L. Dayton, Bannister ...	"	9 5	6½	6	46¼	13½	14½	15	Nil.	101¾
P. Leonard, Gullen	Up-to-date ...	8 11	6	6	42¾	13¼	14½	15	4	101½
J. Flood, Bannister	Factor	8 12	7	6½	43	13¾	14½	15	Nil.	99¾
M. McDonald, Redground ...	"	7 10	6¾	6½	37½	14	15	14½	5	99¼
D. Harries, Bannister ...	Late Factor	8 4	6¾	6	41	13½	14½	15	Nil.	96¾
O. Frost, Bannister	Up-to-date	8 3	6½	6½	40¾	13½	14	15	Nil.	96¼
L. Dayton, Bannister ...	Late Factor	8 0	7¼	6½	40	13¼	14	15	Nil.	96
H. E. Price, Bannister ...	Up-to-date	7 15	6½	6½	38¾	14	14½	15	Nil.	95¼
J. Flood, Bannister	Factor	7 8.	6	6½	37	13¾	14½	15	Nil.	92¾
A. Price and Son, Bannister	Up-to-date	6 4	6¾	6½	31	13½	14½	14½	3	89¾
Lowe Bros., Roslyn	President	5 18	7½	6½	29½	14	14¾	12	5	89¼
J. Flood, Bannister	Factor	6 7	7¼	6½	31¾	13¾	14½	14¾	Nil.	88½
O. Frost, Bannister	Tasmanian Brownell	6 2	6¾	6½	30½	15	14½	15	Nil.	88¼
Frost Bros., Bannister ...	Factor	5 2	7	6½	25½	14	14½	15	5	87½
Lowe Bros., Roslyn	President	5 8	7¼	6½	27	14	14¾	11¾	5	86¼
P. Leonard, Gullen	Tasmanian Brownell..	4 7	7¼	6	21¾	15	14¼	15	4	83¼
Lowe Bros., Roslyn	Factor	4 4	8	6½	21	13¾	14¾	14½	5	83½
Lowe Bros., Roslyn	"	4 5	7½	6½	21¼	13¾	14¾	14½	5	83¼
Plumb & Wray, Cotta Walla	Up-to-date	5 13	5	6½	28¼	13¼	14½	14½	1	83
E. Nugent, Bannister ...	Carman No. 3 ...	4 7	7½	6½	21¾	13½	15	14¾	3	82

Mr. D. Harries (the winner) and *Mr. L. Dayton* (third) originally broke up their land on 20th September. Between this ploughing and planting (on 21st November) both plots were disc-cultivated twice and harrowed once, while 200 lb. of superphosphate was applied by means of the grain and fertiliser drill previous to planting, and the subsequent cultivation consisted of one harrowing. Rows were spaced 2 feet 7 inches apart on Mr. Harries' plot, and 2 feet 6 inches on Mr. Dayton's

Mr. O. Frost (second), one of last year's winners, broke up his land in July. Between that date and planting time the plot was harrowed twice, ploughed, and again harrowed. The crop was fertilised in the drill at planting time, using a small fertiliser attachment on the plough, the application being at the rate of 7 cwt. per acre, made up of 3 cwt. of superphosphate and 4 cwt. of a special proprietary fertiliser. The cultivation after planting consisted of two harrowings. Mr Frost again favoured close spacing of the rows, which were slightly better than 2 feet apart.

The prolific yield of the plants in Mr. D. Harries' crop caused a greater proportion of tubers than usual to break ground, which induced "greening." This defect, coupled with a slight loss from grub infection and some oversized tubers, lost points for this competitor. On the whole, grub caused little loss in the crops, but it was noticeable that infection was worse on the red soils than on the lighter loams.

Batlow District Competition.

This competition was conducted by the local branch of the Agricultural Bureau, and of the twenty-one plots originally entered a number were withdrawn owing chiefly to frost damage at the latter end of January. Fourteen plots remained in for the final adjudication. The average yield of 5 tons 1 cwt. for all plots was highly satisfactory in view of the very droughty

A Pure Seed Plot of Factor.

conditions which prevailed during the summer months. The rainfall was rather more "patchy" in this locality than in other centres. Some individual registrations indicated a satisfactory fall at a time when others were left lamenting. At West Batlow the registration was as follows:—November 22 points, December 95 points, January nil, February 307 points. From 24th December, when 65 points were registered, no further falls (other than two of 5 points each) were recorded until 15th February, when 87 points

relieved the situation. On 17th February, 135 points were registered at one farm at West Batlow, while at Butz Bros. there were only a few spots, and nil at R. Quarmby's.

It is worthy of note that there were seven entries of the variety Factor, and these plots occupied the first seven places in the competition. The original seed of the Factor variety was secured from Crookwell several years ago by the local branch of the Bureau, and is now well distributed throughout the district. The introduction of that original 15-bag consignment has meant hundreds of pounds to the district this year. The season was one which favoured new land.

The whole of the competitors used artificial fertilisers. The purity standard was fairly satisfactory, but there is room for improvement in a number of cases. Wide spacing between the rows was rather general, several having planted with approximately 3 feet separating the rows. The experience in other districts, as in Victoria, indicates that closer spacing is favourable to higher acre yields.

The general appearance of the tubers was exceedingly good. For the most part they were round rather than long, eyes very shallow, and of fresh appearance. The cutting quality was not so satisfactory. Although the flesh of the red-skin varieties cut whiter than the white-skins, they, for the most part, showed blemish in a very pronounced yellow vascular system. The white-skins did not show this defect.

RESULTS of the Batlow Potato Crop-growing Competition.

Competitor.	Variety.	Yield.	Freedom from Disease.		Points for Yield.	Quality.		Purity.	Allowance for previous cropping.	Total Points.
			Tops.	Tubers.		Appearance.	Cutting.			
		tons cwt.								
C. C. Barberie	Factor	9 3	7½	6½	45¾	14	14	14¾	Nil.	102½
J. Bryant (No. 1)	,, ...	8 0	8	6½	40	14	14	15	Nil.	97½
R. Quarmby	,, ...	6 3	8	6½	30¾	14	14	14½	1	88¾
C. Buchele	,, ...	5 17	7¾	6½	29¼	14	14	14¾	Nil.	86¼
J. Quarmby	,, ...	5 8	7½	6¾	27	14	13½	11½	5	85¼
P. and E. Quarmby	,, ...	5 13	8	6	28¼	13¾	14	14¾	Nil.	84¾
J. Bryant (No. 2)	,, ...	4 16	8	6½	24	14	14	15	1	82½
J. Bryant (No. 1)	Satisfaction	4 7	8	6¾	21¾	15	14	14½	2	82
J. Bryant	Early Manistee ...	4 3	7½	6	20¾	14½	14	15	Nil.	77¾
C. Buchele	Tasmanian Brownell..	3 13	8	6½	18¼	15	14	13½	Nil.	75¼
J. Bryant (No. 2)	Satisfaction	3 18	7¾	6	19¾	14½	14	13½	Nil.	75½
Butz Bros.	Up-to-date	4 7	7	6¾	21¾	13	13	11½	1	74
Butz Bros.	Satisfaction	2 16	8	6½	14	14	14	12½	Nil.	69
Butz Bros.	Redsnooth	2 11	7½	6½	12¾	13½	14	11	Nil.	65¼

The lateness of the rainfall gave an advantage to the later-planted crops, and it is interesting to note that the latest planted crop in this year's competition, as also in last year's, eventually proved the winner. Perhaps this indicates, to some extent, that early plantings (October and early November) of the main crop could profitably be eliminated in future. With the possibility of droughty conditions during January, the early planted crops would suffer largely through being at that time at a stage when

moisture is of prime consideration, whereas the later sown crops would just about reach their prime when the monsoonal rain appears. There is, of course, a risk that early frosts may cause damage to late planted crops, but this appears to be less than the risk of reduced yield and inferior quality so often obtained from the early plantings.

Mr. C. C. Barberie selected a plot on a hillside, the soil being a free-working, rich basalt loam well impregnated with bracken fern root. The land was first ploughed on 16th October, and was harrowed with a spading harrow on 23rd October. The crop was planted on 2nd December in rows 2 feet 6½ inches apart, 2 cwt. of superphosphate per acre being applied in the furrow with the sets. The seed used was for the most part seclected from healthy stalks, bearing a good quantity of marketable tubers of good shape and typical of the variety. The smaller seed, up to 1½ inches in diameter, was planted whole, but large tubers were cut. The seed, after selection, was stored about two deep in a shed, which allowed of greening and kept it in excellent condition for late planting. The after-cultivation consisted of one harrowing on 14th January, a cultivation on 26th February, and the pulling out by hand of bracken as it appeared.

Mr. J. Bryant (second) first ploughed on 20th August, and harrowed 26th August; cross-ploughed on 2nd November, harrowed on 3rd November, and planted on 29th November in rows 3 feet apart, using 7 cwt. of seed on the half-acre. The seed was stored in bags in a shed until early October, then spread out on the floor to green, and the best-shaped tubers selected for the plot. Fertiliser at the rate of 360 lb. superphosphate and 100 lb. sulphate of ammonia per acre was applied in the furrows at planting. The after-cultivation consisted of one harrowing immediately planting was completed and the hand pulling of bracken. Owing to the robust top growth no further cultivation was possible.

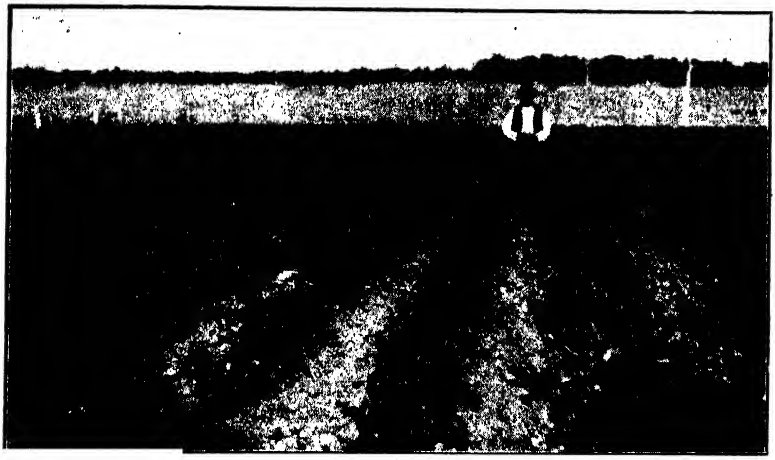
Mr. R. Quarmby (third) did not plough until 16th November, and between that operation and planting (on 4th December) one harrowing was given. The seed was of large size, and approximately two-thirds was cut. Superphosphate was applied in the furrows with the seed at the rate of 260 lb. per acre.

Taralga District Competition.

This was the third competition carried out in this district. Owing to the very dry conditions which prevailed during the early part of the year, many farmers were averse to entering their crops, and only eight entries were received at closing date. After the February rains other farmers were anxious to enter plots which had been sown at the specified time, but the local A.P. and H. Society, under whose auspices the competition was conducted, decided to adhere to the original conditions governing the competition. Of the original entries only six remained for final inspection. These six entries produced an average acre yield of 6 tons 7 cwt.

As in other districts very trying conditions were experienced until mid-February, when good rains were experienced. Had the rain fallen a fortnight earlier some exceptional yields would have been secured. Several of the crops had passed their prime when rain fell, but the slight check was too much of a handicap.

This district again upheld its reputation for purity, and every competitor secured full points under this heading. Many orders for seed were received by farmers in the district, and these were largely repeat orders from satisfied farmers who traded with many of the previous year's competitors.



A Plot on Mr. D. Wright's Property at Taralga.

The lighter type loams withstood the dry conditions better than the chocolate loams of the district. During the dry period before the rain, grasshoppers were fairly prevalent and damaged the crops to a varying extent.

RESULTS of the Taralga Potato Crop-growing Competition.

Competitor.	Variety.	Yield.	Freedom from Disease.		Points for Yield.	Quality.		Purity.	Allowance for previous cropping.	Total Points.
			Tops.	Tubers.		Appearance.	Cutting.			
		tons cwt.								
D. Wright	Factor	9 3	8	6½	45¾	13½	14½	15	Nil.	103¾
D. Wright	Big Top Brownell ...	6 14	8	6½	33½	13	14½	15	Nil.	90½
A. Johns	Up-to-date	6 8	6¾	6½	32	13½	14½	15	Nil.	88¼
W. J. McPaul (No. 1) ...	Factor	5 15	7¾	6½	28¾	14	14½	15	1	87½
L. North	,, ...	5 17	6	6½	29¼	13½	14½	15	Nil.	84¾
W. J. McPaul (No. 2) ...	,, ...	4 7	7¾	6½	21¾	14	14½	15	1	80½

Mr. D. Wright, who secured first and second places, was the winner of the initial competition three years ago, and he also secured third place last season. New land was selected for the Factor plot and was originally

broken up on 10th July, two-way disced, again ploughed on 1st October, and then one-way disced. A proprietary mixed fertiliser was applied at the rate of 200 lb. per acre with a combine drill preparatory to planting, which took place on 4th November. The subsequent cultivation consisted of one harrowing. Mr. Wright worked up his strain of Factor from a few selected plants. Three years ago this variety was represented on his farm by only three small rows planted with selected seed.

Mr. Wright's plot of Big Top Brownell received almost identical treatment to the Factor plot. This variety produced a good deal of second growth, and lost a good deal in yield owing to the loss in weight through stag-ends, which were discarded.

Mr. A. Johns, who secured third place, is one of the younger generation of potato growers. The seed used by him in the plot was grown from selected plants, and in close proximity several rows of potatoes could be seen which were planted from seed obtained from plants which last year produced not less than ten marketable tubers.

College Students Desirous of Gaining Farm and Station Experience.

On completion of the Hawkesbury Agricultural College Diploma Course in Agriculture at the end of the year, several students are desirous of gaining further practical experience on stations or farms. These lads, about 19 to 21 years of age, have obtained a thorough grounding in the theory and practice of agriculture during the three years they have been in residence, and can be rcommended to station owners and farmers desiring their services.

Should any farmer or pastoralist be desirous of obtaining the services of any of these lads, he should communicate with the Principal, Hawkesbury Agricultural College, Richmond.

Also, during the midsummer vacation (12th December, 1929, to 22nd January, 1930, inclusive), some of the College students are anxious to gain practical experience on approved farms. These students are about 17 to 20 years of age, and the Principal would be pleased to hear from any farmer or grazier who is able to place one or more of these students.

England Imports Larger Quantities of Our Products.

According to the latest report of the Empire Marketing Board, London, high record shipments of various Empire-grown foodstuffs have been achieved during the two years that the Board has been functioning. Australian sultanas and raisins imported in 1927 were 160,000 cwt. greater than in any previous season, while Australian wine more than doubled its previous highest figure. Severe frosts towards the end of 1927 lowered these imports in 1928, but Australian apples, pears, and canned fruit all made records. Such facts suggest that the marketing of Empire produce is being actively pursued in Great Britain.

Varieties of Lettuce.

N. S. SHIRLOW, B.Sc.Agr., Assistant Plant Breeder, Hawkesbury Agricultural College.

In the course of improvement work undertaken with lettuce at Hawkesbury Agricultural College, a number of varieties listed by local seedsmen have been under observation as to the possibilities of improvement by selection and by cross-breeding, and detailed studies for classification and descriptive purposes have shown that many of these varieties are identical.

These varieties of lettuce have been classified as follows:—

Crisp, Curled Types.

(*a*) Curly or crinkled leaved.—American Summer, Brittle Ice, Champion Cabbage, Drumhead or Malta, Hanson, Iceberg, Mignonette, Neapolitan, Rockdale Surprise, Tender-and-True, Webb's Wonderful, Wonderful or New York.

(*b*) Prickly leaved.—Boston Curled, Evergood, Ohio, Grand Rapids.

Butter-head Types.

All-the-Year-Round, Big Boston, Californian Cream Butter, Continuity, Deacon, Mammoth Salamander, May King, Tom Thumb.

Cos Types.

Champion Cos, Paris Green Cos, Paris White Cos.

The curly or crinkled leaved lettuce of the crisp, curled type constitute by far the most important group from the commercial standpoint. The smooth-leaved butter-head types are more tender, and do not stand relatively hot, dry conditions as well, nor are they as popular on the market, although they are of value for the home garden.

Of the curly cabbage-headed types, it is considered that the names Neapolitan, Rockdale Surprise, Webb's Wonderful, Wonderful and New York are synonyms for the same variety, which is best known as Wonderful. These are large types with medium dark green leaves.

Champion Cabbage and Iceberg are regarded as being identical, and these are large, light green in colour, with red margins on the leaves.

American Summer, Hanson, and Tender-and-True are practically identical, being of similar type to the last-mentioned two, but with no red margins on the leaves.

Drumhead is distinct from the above varieties. The size is large, and the leaves are not so crinkled, and are decidedly coarse and hard in texture.

Brittle Ice differs from all the preceding varieties, with the exception of Drumhead, being much coarser in the leaves, and comparatively is not of much commercial value.

Mignonette is a rather small, cabbage-headed type for market, but its excellent quality would make it very useful in the home garden.

The prickly-leaved varieties, Boston Curled, Evergood, Ohio, and Grand Rapids, do not compare in quality with the preceding varieties, and are not of value commercially, some of them being entirely loose-leaved and not forming hearts. Ohio is identical with Evergood.

Of the butter-head types, Big Boston, May King, and Californian Cream Butter have green leaves showing red margins, and differ slightly in colour and size.

Big Boston is the largest, and is of a light dull green colour, but the hearts are not very firm and the after-taste slightly bitter.

Californian Cream Butter has a darker glossy green appearance, and is of better quality.

All-the-Year-Round and Deacon are of a similar type to these three varieties, with no red margins on the leaves.

Continuity is distinct, having entirely reddish-brown leaves tinged with green. This variety is very early and of very good quality.

Mammoth Salamander, though small, has good hearting and eating qualities.

Tom Thumb is very small, and distinct from other varieties, being fairly sweet, and between the butter and crisp varieties in flavour and firmness.

The Cos varieties are of loose-leaved, upright growth, and are of no value commercially.

A New Edition of the Farmers' Handbook.

A NEW and enlarged edition (the fifth) of the *Farmers' Handbook* is now available. Price 11s. 4d., including postage; obtainable from the Government Printer, Phillip-street, Sydney, or from the Department of Agriculture, Box 36A, G.P.O., Sydney.

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1929.

Murwillumbah (T. M. Kennedy)	Nov.	27, 28

1930.

Coff's Harbour (J. Walters) ...	... Jan.	25, 27
Leeton (W. Roseward) ...	... Feb.	11, 12
Pambula (L. K. Longhurst) ...	,,	21, 22
Newcastle (P. Leegoe)	,,	25, 28, Mar. 1
Uralla (D. G. Evans)	,,	26, 27
Oberon (F. H, Kelly)	,,	27, 28
Gunning (G. E. Ardill)	,,	27, 28, Mar. 1
Bowraville (A. H. Newman) ...	Mar.	4, 5
West Maitland (M. A. Brown)...	,,	5 to 8
Wallamba (E. A. Carey) ...	,,	6, 7
Rydal (H. Murray) ...	... Mar.	7, 8
Dorrigo (J. H. Skeoch)	,,	12, 13
Batlow (C. S. Gregory)	,,	25, 26
Kempsey (E. Mitchell)	,,	26, 27, 28
Dungog (W. H. Green) ...	... April	2 to 4
Sydney Royal (G. C. Somerville)	,,	15 to 26
Orange (G. L. Williams)	... May	6, 7, 8
Grafton (L. C. Lawson)... ...	,,	7 to 10
Casino	,,	13, 15
Wagga (F. H. Croaker)...	... Aug.	26, 27, 28
Junee (G. W. Scrivener)	... Sept.	2, 3

Late Tomatoes.

J. DOUGLASS, H.D.A., H.D.D., Agricultural Instructor.

IT is always found that the highest prices realised for tomatoes are those obtained for the early crop. This does not necessarily mean that the early crop is the best paying one. Normally, all tomato crops can be made payable ventures providing methods are used which suit the particular season of planting, and if the season of planting is suited by the soil and district.

The early tomato crop, being grown out of season, demands the greatest amount of skill and attention. No other tomato crop requires the expenditure of so much time, labour, and money in order to obtain payable results. For early tomato work a rather expensive plant and a fair amount of equipment is necessary. Apart from the amount of capital required to raise an early crop successfully, many growers are prevented from concentrating on this crop by the unfavourable climatic conditions in their locality. On the other hand, many farmers situated on medium-priced land make a speciality of late crops. Late crops are grown in the natural growing season of the tomato, and consequently demand comparatively little attention. Land values in districts where late crops are grown are usually fairly low, while the soil lends itself to easy cultivation, and large areas can be devoted to tomatoes with only moderate outlays. As an offset to these advantages yields are usually only fair, prices never abnormally high, and loss due to weather conditions, &c., heavy.

Precautions Necessary with the Late Crop.

Although late tomatoes are comparatively easily grown, a few extra precautions will usually make all the difference between a successful crop and a failure. The growing of suitable varieties is most essential, while the correct use of fertilisers, and care in raising seedlings, &c., are also important items that demand attention.

Little difficulty is experienced in germinating the seed at the correct time, but growers are usually lax in thinning out in order to harden the plants. If field conditions are unsuitable for planting, the seedlings should always be transplanted into frames, the plants being spaced in order to prevent their running too high. The field should be ploughed deeply as early as possible and correct methods of fallowing adopted in order to ensure a weed-free seed-bed well supplied with soil moisture and available plant food.

The fertiliser recommended for tomatoes is 4 cwt. per acre of equal parts of bonedust and superphosphate, spread along the open drills previous to transplanting. Later, when the first fruit is half grown, a top-dressing of one part of sulphate of ammonia and five parts of superphosphate, used at the rate of 2 cwt. per acre, spread along the rows between the plants, will produce excellent results.

One of the most important factors in the successful growing of a late crop is the constant spraying of the plants with Bordeaux mixture, as a preventive for late blight. This should be carried out from the seedling stage until the crop is harvested.

Suitable Late Varieties.

There is very little reliable information on the most suitable varieties for the late tomato crop. With the object of ascertaining the best yielding and most suitable variety of tomato for this purpose, a trial was conducted in co-operation with Mr. Gordon Townsend, Penrith.

Mr. Townsend grew a very successful late tomato crop and attributed much of his success to the fact that he carried out the recommendations of this Department. The seed was sown on 22nd November, 1928, and tranplanted into rows 10 inches apart on 2nd January, 1929. The persistent dry weather made field transplanting rather uncertain, so the plants were placed in rows to harden them off in order that they would withstand field transplanting later. It might be mentioned that many growers in the district experienced total losses of their seedlings, due to the fact that they were not hardened off. Before transplanting the seedlings to the field, 4 cwt. of bonedust and superphosphate were broadcasted along the rows. Field transplanting took place during the period from 24th January to 1st February, 1929, the plants being spaced 4 feet 6 inches apart in rows 5 feet 6 inches apart. This grower top-dressed his crop according to the recommendations of the Department. The effect of the dressing was to fill out the fruit and hasten maturity.

YIELDS in Late Tomato Variety Trial.

Bonny Best	360 cases per acre.
Marglobe	350 „ „
Marvel	320 „ „
Marvelosa	240 „ „
Norduke...	200 „ „

Points in the Selection of Late Varieties.

In selecting a tomato for late planting there are more points to be considered than with any other crop. In the first case, length of maturity is a most important item. In the past, it has been recommended to grow late maturing types in order to get fruit as late as possible; autumn weather has a tendency to quicken maturity of early types. In comparatively frost-free districts such as Gosford lateness of maturity is of some importance, but in most late districts such as Penrith, Richmond, Liverpool, &c., frosts invariably destroy the plants before the total fruit is harvested. Another important fact is that long maturing varieties occupy the land for a longer period and there is a greater chance of their being destroyed by diseases, unfavourable weather conditions, &c., than in the case of early maturing types.

In the past season, particularly where no early frosts occurred, Norton and Stone both produced good yields. It is now thought that, by planting

early or second-early types a little later than late sorts, more reliable returns can be obtained over a number of years. This was borne out by this year's results, late varieties being destroyed by frosts while carrying large quantities of green fruit.

Disease Resistance an Important Factor.

Another very important point in selecting late crop varieties is disease resistance, and coupled with this is ability to withstand wet conditions. Many varieties have been bred and selected with the object of resisting fusarium wilt. It has been found in some of these varieties that, although they are not resistant to other diseases, they are less susceptible than ordinary varieties. In the past Norton has proved to be a very hardy type and has always been the last variety to be destroyed by late blight. Varieties such as Earliana are found to be unsuitable for autumn crops. Commercial growers stick largely to Chalk's Early Jewel, but are changing over to Bonny Best, a variety selected from Chalk's. Bonny Best is in no way resistant, but has a sturdy constitution and is a persistent cropper This variety gave the best results in the trial conducted by Mr. Townsend.

Marglobe, a variety reputed to be resistant to fusarium wilt, produced excellent results. It was found, however, that the fruit crack vertically. Selection work is being carried out in order to try and remove this defect.

Marglobe was found to be an excellent carrying variety.

Marvelosa is a sturdy pink tomato, and stood up to cold, wet conditions. It was found that the fruit of this variety did not crack, was of very high quality, and hung on the vines without rotting longer than other varieties.

Norduke is a medium late variety, has heavy foliage and is a sturdy grower. This variety would have done better if planted earlier.

The Utilisation of Surplus Canning Peaches.

Experiments have been conducted by the University of California, commercial canners, and others interested in the problem of the profitable utilisation of surplus canning peaches, and a report on the results of those experiments has been made by Messrs. W. V. Cruess, P. F. Nichols and other members of the Fruit Products Laboratory of the University of California.

Of all the by-products tested, the investigators believe that the canned product known as "crushed peaches" or "peach crush" gives the greatest promise of success. Canned pickled peaches, diced or cubed peaches, peach puree, and sun-dried lye-peeled whole peaches are claimed to be satisfactory products with some commercial possibilities. The use of peaches for the production of industrial alcohol is not considered feasible from the standpoint of cost and return. In the same way these investigators are of opinion that peaches are less suitable than cull apples and waste apple peels and cores for the manufacture of vinegar, and they express the doubt as to whether peach vinegar could successfully compete with apple vinegar.

The Protection of Buildings from White Ant Attack.

N. L. JONES, Supervising Architect.

WHEN erecting a cottage in a district in which white ants are very troublesome, it is desirable to take every possible precaution to guard against the pests gaining entrance to the building. While the protective measures indicated in the following statement may appear elaborate, no structure could be considered proof against ants unless they had been adopted, or alternatively some ant-resistant timber had been used in the construction.

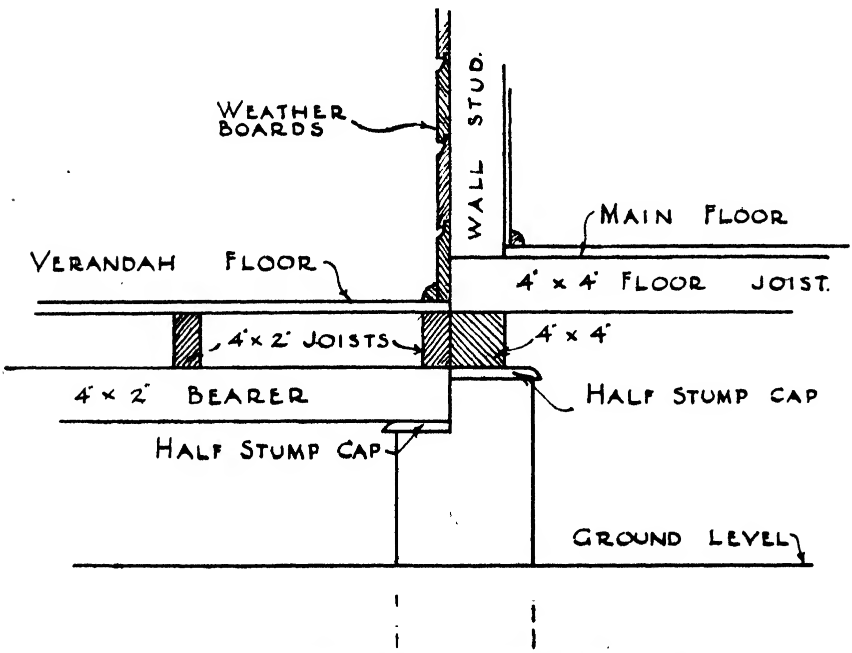


Fig. 1.—The two Half-caps on the Pier Serve no Practical Purpose.

It has been my experience that the most successful white ant repellent is creosote oil—a coal-tar distillate—but that treatment of the floor timbers alone is not sufficient protection for a wood-frame building. To effectively resist white ant attack, the following precautions are necessary:—

Put galvanised-iron caps with projecting, turned-down edges (shaped like an inverted saucer) to all foundation stumps or piers.

A frequent point of entry to wall timbers is around chimneys and bricked-in laundry boilers. To prevent the ants entering at these places build into the chimney, below the floor level, plain galvanised iron, so that it projects 2 inches from the brickwork, and turn it down similar to the stump caps. The same procedure should be adopted with the laundry copper. When filling fireplaces with earth or sand for concrete hearths, fill in a few inches at a time, level off, and sprinkle liberally with creosote, the idea being to impregnate the filling with creosote so that termites will not nest in it.

Construct the floor of the building 18 inches to 2 feet above the ground. Provide plenty of ventilation under the floors. This is also necessary for health reasons, as lack of ventilation is often, in the case of brick buildings, an unsuspected cause of dampness in the house, besides an inducement to dry rot.

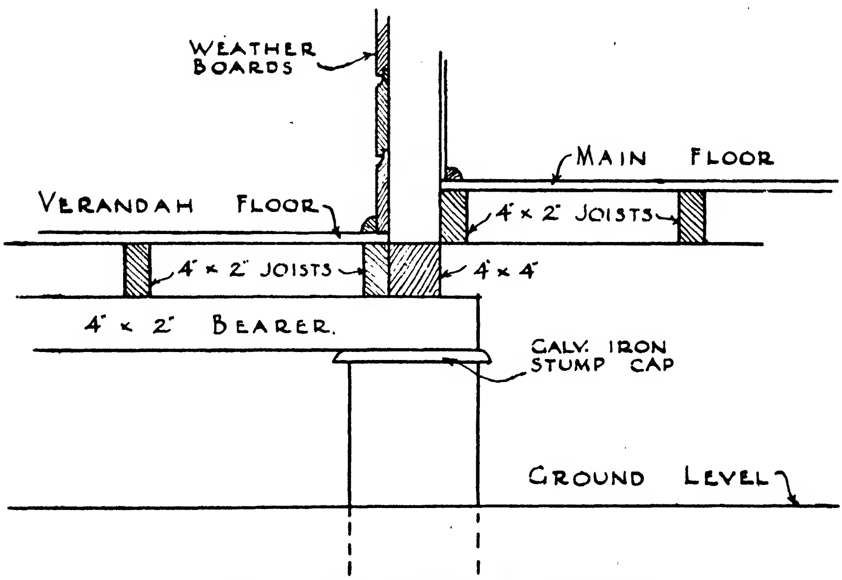


Fig. 2.—Showing Correct Construction, with Full Stump Cap.

Paint the bottom wall-plates, bearers, and joists with one good coat of creosote before fixing in position and again after placing in position. The object of painting before fixing is to get at the ends of the timbers and other parts not accessible afterwards.

See that verandah bearers have a full stump cap under them. A common fault in construction is for the verandah and wall bearers to meet at the supporting piers, as illustrated in Fig. 1. Here two half-caps are placed on the pier, but they serve no practical purpose. The correct construction is illustrated in Fig. 2, where a full stump cap is used.

Make clean under the floors by removing all chips or other wood debris.

Paint wood foundation stumps before they are set in the ground with two coats of creosote oil, also pour a little in the stump hole before putting the block in. It is cheap enough, and white ants do not like it.

In the case of brick buildings it is, of course, useless to put iron caps to piers, since the ants could work up the walls. Neither is it necessary, for, if the floor timbers, such as plates, bearers, and joists are of hardwood and well painted with creosote, attack need not be feared, provided that ventilation to prevent dampness, &c., has been given due consideration.

Tubercle-free Herds.

Of the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number tested.	Expiry date of this Certification.
J. L. W. Barton, Wallerawang	22	11 Oct., 1929
Kyong School, Moss Vale	2	21 ,, 1929
Blessed Chanel's Seminary, Mittagong	4	25 ,, 1929
W. McLean, Unanderra	44	1 Dec., 1929
Department of Education, Brush Farm, Eastwood	8	5 ,, 1929
Lunacy Department, Morisset Mental Hospital	21	7 ,, 1929
J. Davies, Puen Buen, Scone (Jerseys)	39	12 ,, 1929
Kinross Bros, Minnamurra, Inverell (Guernseys)	73	14 ,, 1929
Lunacy Department, Callan Park Mental Hospital	22	19 ,, 1929
Miss Brennan, Arrankamp, Bowral	14	20 ,, 1929
E. S. Cameron, Big Plain, Narrandera	39	10 Jan., 1930
Lunacy Department, Rydalmere Mental Hospital	68	11 ,, 1930
G. A. Parrish, Jerseyland, Berry	77	12 ,, 1930
New England Girls' Grammar School, Armidale	28	16 ,, 1930
G. Miller, Casula	15	1 Feb., 1930
Queanbeyan Municipality (various owners)	41	1 ,, 1930
St. Joseph's Convent, Reynold-street, Goulburn	5	19 ,, 1930
St. John's Boys' Orphanage, Goulburn	9	19 ,, 1930
St. Michael's Novitiate, Goulburn	5	20 ,, 1930
Department of Education, Yanco Agricultural High School	32	23 ,, 1930
Lunacy Department, Kenmore Mental Hospital	81	28 ,, 1930
St. Joseph's Girls' Orphanage, Kenmore	9	1 Mar., 1930
Tudor House School, Moss Vale	8	6 ,, 1930
Department of Education, Hurlstone Agricultural High School	42	10 April, 1930
Navua Ltd., Grose Wold, via Richmond (Jerseys)	10	11 ,, 1930
Australian Missionary College, Cooranbong	43	17 ,, 1930
Department of Education, Gosford Farm Homes	37	24 May, 1930
William Thompson Masonic School, Baulkham Hills	27	24 ,, 1930
F. W. Hopley, Leeton	29	29 ,, 1930
J. F. Chaffey, Glen Innes (Ayrshires)	56	29 ,, 1930
P. Ubrihien, Corridgeree, Bega	119	8 June, 1930
E. P. Perry, Nundorah, Parkville (Guernseys)	23	14 ,, 1930
Sacred Heart Convent, Bowral	11	17 July, 1930
Marion Hill Convent of Mercy, Goulburn	12	19 ,, 1930
A. Shaw, Barrington (Milking Shorthorns)	104	2 Aug., 1930
St. Patrick's College, Goulburn	9	7 ,, 1930
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	52	17 ,, 1930
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	78	4 Sept., 1930
James McCormick, Tumut	94	5 ,, 1930
Walaroi College, Orange	8	19 ,, 1930
Riverstone Meat Co., Riverstone Meat Works, Riverstone	115	27 ,, 1930

—Max Henry, Chief Veterinary Surgeon.

The Apple Root Weevil (*Leptops squalidus*, Boh.) as a Pest of Citrus.

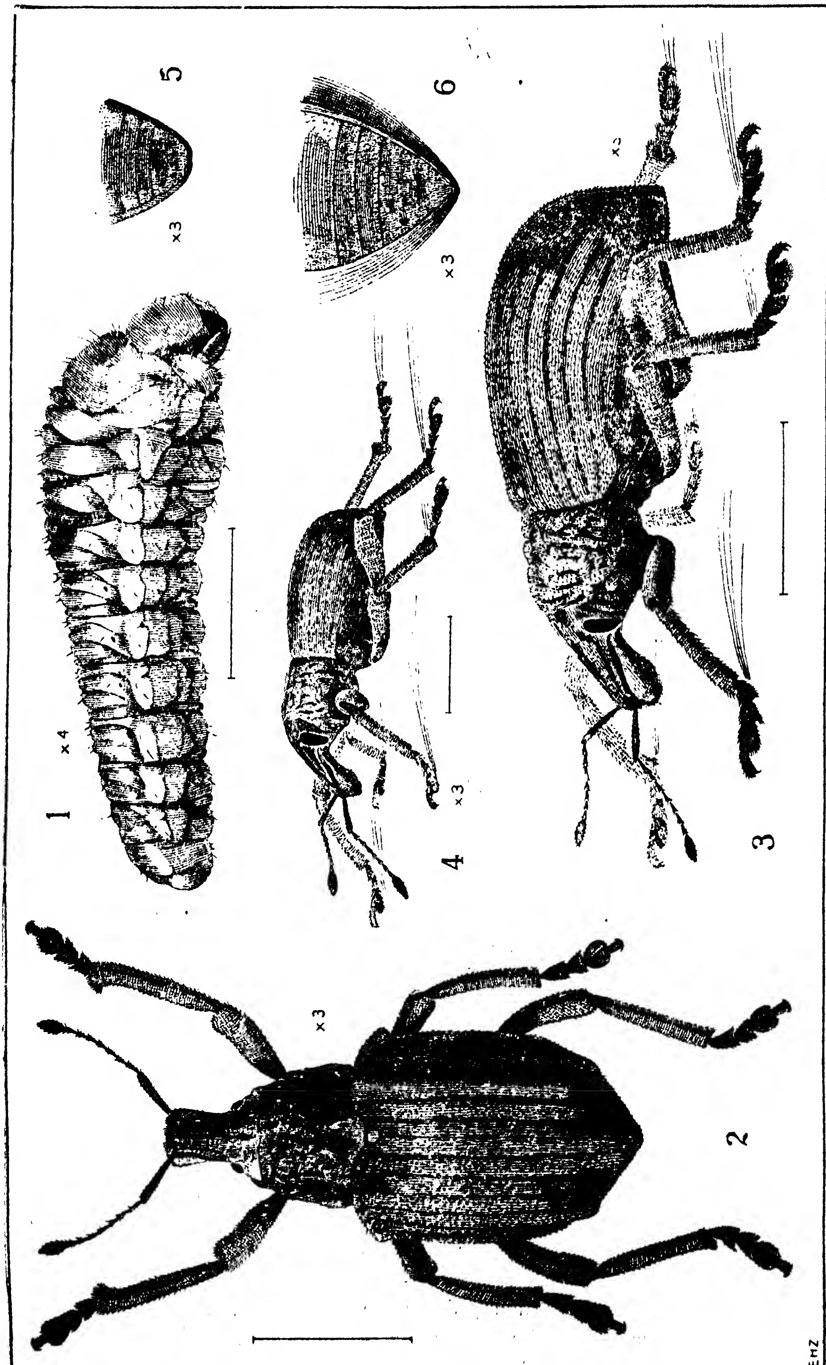
A. R. WOODHILL, B.Sc.Agr., Assistant Entomologist.

In November, 1928, a severe "dieback" condition, which was apparent in the trees in several citrus orchards in the Windsor district, was reported by Mr. W. H. Spinks, the local fruit inspector, and was definitely proved to be caused by beetle grubs feeding on the roots. This beetle was indentified as the apple root weevil (*Leptops squalidus*, Boh.), which has long been known as a minor pest of apples in the coastal districts of New South Wales, but had not previously been recorded attacking citrus in this State. In Victoria it has been a serious pest of apples and, to a lesser extent, of citrus for many years.

Life History of the Beetle.

During the early summer months the adult female beetles deposit eggs on the leaves, and from these eggs minute grubs hatch and crawl down the trunk to the roots where they commence to feed. When fully grown the grubs are three-quarters of an inch in length, creamy-white in colour, and furnished with strong jaws. When feeding they gouge out a deep furrow along the surface of the root, and when present in large numbers cause the infested roots to die. During late winter the grubs pupate in the soil and change into beetles, which commence to emerge early in August. This emergence of beetles continues for a long period—from about 1st August to about 31st October or later. As the beetles emerge from the soil they make their way to the trunk and crawl up among the foliage where they feed on the young leaves and shoots. Eggs are later deposited on the leaves by the females, and the life cycle thus completed.

The pest is a serious one when it becomes well established, and is capable of completely destroying an orchard if no control measures are undertaken and the beetles are allowed to breed unchecked for a number of years. Growers are therefore warned to keep a close watch for this beetle and adopt control measures before the trees are permanently injured. The beetle itself is about seven-eighths of an inch in length, is wingless, buff coloured, and of the weevil type, its head being drawn out into a long snout. Where trees become thin and sickly-looking, showing a general "dieback" condition, dropping of the leaves, etc., the presence of the beetle should be suspected, particularly on river flats that are subject to flooding. An examination of the roots will give a definite indication whether the beetles are present, but this may necessitate digging 3 or 4 feet under the crown of the tree, as very often the surface roots are not damaged. Any grower who is doubtful whether the beetle is present in his orchard is advised to communicate with the local fruit inspector.



Apple Root Weevil (*Leptops squalidus*, Boh.)

(1) Larva. (2) Female beetle (dorsal view). (3) Female beetle (side view). (4) Male beetle. (5) Tip of abdomen of male beetle. (6) Tip of abdomen of female beetle.

Control.

Experiments to determine the most effective method of control were commenced shortly after the infestation was reported, and while these are not yet complete it is considered, from the data so far available, that the following method will prove effective.

The control recommended is to band the trunks of the trees with an effective banding material to prevent the beetles from crawling up onto the trees, and to collect and destroy at least once a week the beetles which

Typical of the Damage Caused by the Pest.

congregate on the trunk below the bands and on the soil near the base of the trunk. The band should be placed as high as possible on the trunk below the main branches, and where a number of branches arise from near ground level each of these should be banded separately. The band should be two or three inches in width and the material should be applied as thickly as possible.

In dusty windy weather it is necessary to freshen the surface of the bands by scraping them, and to remove leaves, etc., which may have stuck to them. It is essential to prune the lower branches of the trees so that

they are clear of the ground, and to keep down weeds and grass which, if allowed to grow up until they touch the branches, would enable the beetles to reach the trees without crawling up the trunk.

In the experiments which are in progress this method so far has given every indication of being entirely successful, 65,000 beetles having been collected and destroyed in an orchard of 1,800 trees since the beginning

A More Advanced Stage of the Trouble.

of August. Of this 65,000 beetles at least 90 per cent. were collected from 800 trees, the remainder of the trees being only lightly infested. It is considered that this wholesale destruction of beetles will prevent re-infestation to any extent next season.

Banding and the collection and destruction of beetles should commence by the middle of July and should be continued throughout the spring and early summer until the beetles cease to emerge. All growers in infested areas are advised to band a few trees in various places throughout their orchards in order to ascertain whether the beetles are present, as they are difficult to locate in the foliage. If any beetles are present energetic

control measures should be undertaken now and next July, as the beetles breed up with great rapidity, each female being capable of laying up to ninety eggs. It is important that growers should adopt control measures before the trees show signs of damage.

It is emphasised that, although the pest is a serious one, growers need not be unduly alarmed, provided they keep a close watch for it and adopt control measures in the early stages of an infestation.

A full account of the experiments will be published when they are completed.

"Minerals in Pastures and Their Relation to Animal Nutrition."

It would have been difficult to have chosen a more opportune time for the publication of this book, by Dr. J. B. Orr, Director of the Rowett Research Institute, and Miss Helen Scherbatoff. The work is really a review of all available literature from the different countries of the Empire on the question of malnutrition in cattle and sheep, due to mineral deficiencies in pastures.

A little history will help more fully to explain the scope of this work. In 1926 the Civil Research Committee of the British Cabinet appointed a sub-committee of experts to report on the relationship between the mineral contents of pastures and their nutritive value. Accordingly, a questionnaire was issued to the various Governments within the Empire, from the replies to which it was learned that not only was the question already engaging the attention of different countries, but that the problem was one of such economic importance as to warrant some form of systematic investigation, and an important part of such an investigation was considered to be the collection and arrangement of all available information on the subject. The book that has just been issued contains the information so far obtained, and should prove of value to those employed in, as well as those directing, research work in this subject.

Messrs. H. K. Lewis and Co. Ltd., publishers, of London, kindly sent along our copy. The book only comprises 150 pages, from which it will be concluded that the publications reviewed are only touched on briefly. Research workers will appreciate the bibliographical references at the end of each chapter.

Infectious Diseases Reported in September.

The following outbreaks of the more important infectious diseases were reported during the month of September, 1929:—

Anthrax	1
Blackleg	1
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia contagiosa	13
Swine fever	Nil.
Contagious pneumonia	Nil.

—Max Henry, Chief Veterinary Surgeon.

Alysia manducator Pz.

AN INTRODUCED PARASITE OF THE SHEEP BLOWFLY MAGGOT.

W. L. MORGAN, B.Sc.Agr., Assistant Entomologist.

THE value and importance of possible biologic control of sheep blowfly by means of parasites and predators led to investigations being made along these lines in 1924 by Mr. W. B. Gurney, Entomologist of this Department, and in a report on the work done up to 1927 (see *Agricultural Gazette*, November, 1928), he mentioned that seven hymenopterous internal parasites had already been recorded from Australia, namely, *Mormoniella* (*Nasonia*) *brevicornis*, Ashm.; *Spalangia muscidarum*, Rich.; *Dirrhinus sarcophagae*. Frogg.; *Chalcis calliphorae*, Frogg.; *Australencyrtus giraulti*, John. and Tiegs; *Stenosterys fulvoventralis*, Dodd; and *Pachycrepoideus dubius*, Ashm. Of these *Mormoniella* (*Nasonia*) *brevicornis* had been tested on a large scale by the distribution of millions of living parasites developed in the Department's insectaries. These wasps had been established widely throughout the western districts, but up till the time of reporting (1927) had exercised no appreciable control over the sheep blowfly.

Description and Life Cycle.

Alysia manducator is a blackish, rather stoutly-built wasp belonging to the family *Braconidae*, or, according to Ashmead, to the family *Alysiidae*. In the laboratory in Sydney the life cycle from egg to adult emergence occupies a period of about thirty-five days in summer, forty-five days in spring and autumn, and sixty-five days in winter. Myers gives the following periods as being typical of the development of *Alysia*:—

From laying of egg to completion of feeding...	10	days.
From this to pupation	16	,,
Pupal stage	12	,,
Adult lying inert on side before evacuation of meconium ...	3	,,
Total	41	days.

The Egg.—The egg measures 0.5 x 0.1 m.m. (Fig. 1 (1)), is translucent white in colour, and is slightly crescent-shaped, with a rounded protuberance at the posterior end. It hatches two or three days after oviposition, sometimes before the maggot has pupated.

The Larva.—The larval instars and their structure have been well described by Alston. In the last instar of the larva (Fig. 1 (2)) there are nine pairs of lateral spiracles. The first pair of spiracles, however, we find present on the first thoracic segment, although Alston considers they are on the second thoracic segment. The integument is covered with fine minute setae and scattered sensory hairs. The head (Fig. 1 (3)) bears a pair of well-developed mandibles as well as other mouth parts. The shortest period recorded by Alston for the development from the egg to the fully-

grown larva is eighteen days, and the longest 112 days. Preparatory to pupating the fully-fed larva spins a strong silken cocoon (Fig. 1 [5]), within the blowfly puparium. Meanwhile the blowfly puparium has become considerably shrunken and excessively wrinkled, the segmentation becoming more pronounced. The propupal stage varies from a few days to many weeks, two days being the minimum recorded by Alston.

The Pupa.—At 21 deg. C., Alston records that the pupal period varies from seven to ten days; the pupa (Fig. 1 [4]) is at first white, the eyes then become reddish, and later the whole of the body and its appendages gradually become pigmented. The adult *Alysia* wasp with wings fully expanded emerges after first biting a hole through the blowfly puparium.

The Adult.—The adult (Fig. 1 [2]), which varies very considerably in size ($\frac{3}{8}$ to $\frac{5}{8}$ inches in length), is of the typical Braconid type. The transparent wings, in rest, are folded along the length of the body. The body colour is a shiny black, the abdomen of the female being sometimes brownish black. The eyes and antennae are black also, but the legs are dark reddish-brown. The antennae of the males (Fig. 1 [2]) are decidedly longer than those of the females (Fig. 1 [1]), and each antenna consists of forty-one segments, while the female antenna consists of thirty-three segments. The mandibles (see [1] and [2] of Fig 1) are distinctive of the genus *Alysia,* and this character has led Ashmead to give this genus family rank. The difference in the length of the antennae and in the shape of the abdomen are the distinguishing features between male and female.

Adults that hatch from pupae buried in soil to a depth of several inches are able to work their way between soil particles and emerge successfully. *Alysia* is capable of strong flight, which should enable it to cover long distances when searching for maggot-infested carcases.

The graphs of emergence of the progeny of a single female would show that the males actually commence to hatch three to eight days before the females, and that the maximum emergence of males tends to occur one to two days before or after the first emergence of females. The females reach their maximum four to five days later than the maximum male emergence, while the last few individuals to hatch are usually females.

Mating and Longevity of the Adults.

Mating occurs shortly after the emergence. Myers records having kept seventeen males alive in captivity for periods of from three to forty days. Five females were kept one month and then allowed to oviposit for a short period each day. These females attained imaginal ages of 40, 42 (two), and 43 (two) days, respectively. The normal life of the adult females in our cages is about three weeks.

Oviposition and Fecundity.

In Sydney, oviposition has been obtained with females which were 14 days old, whilst in England five females which were 32 days old oviposited successfully. The act of oviposition lasts about two minutes, the maggots

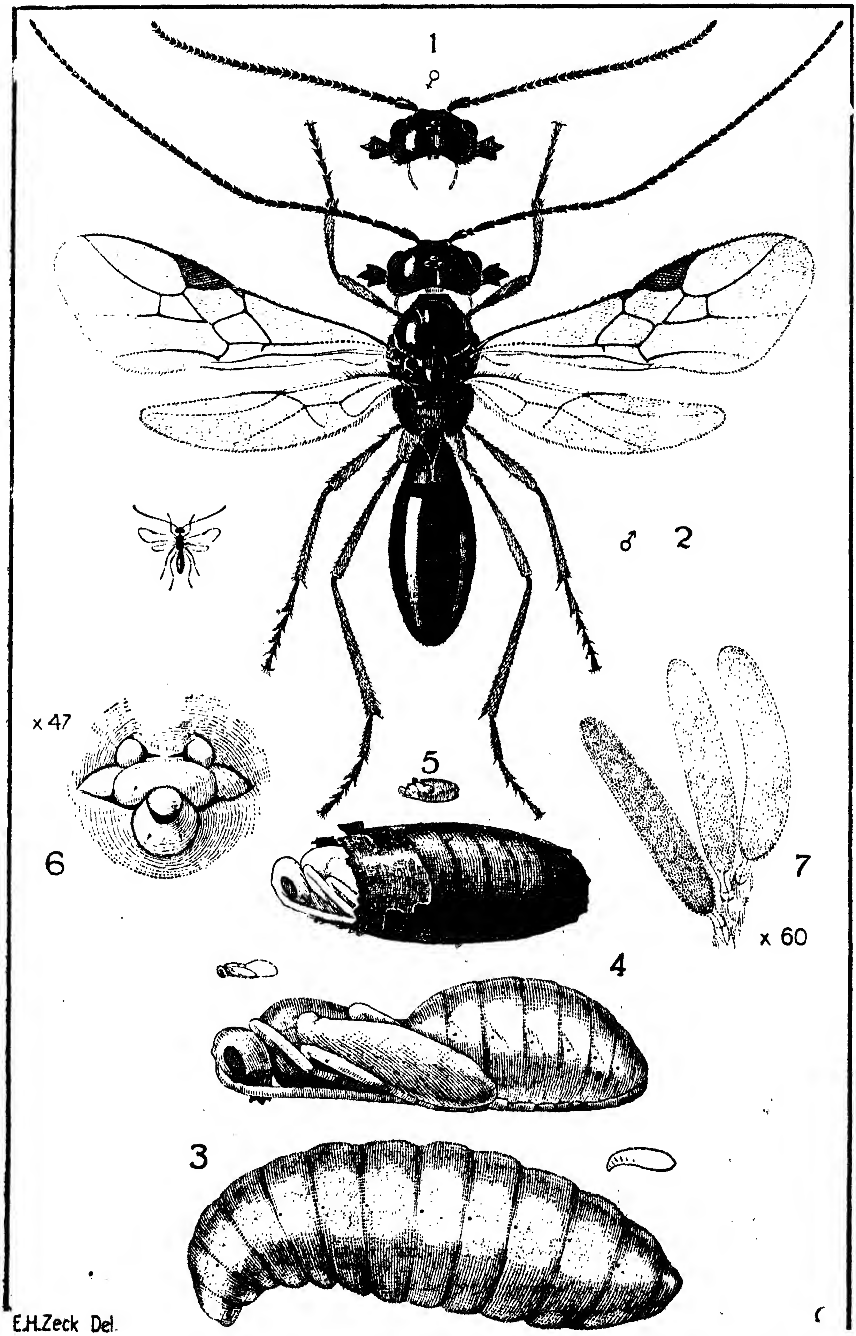


Fig. 1. Blowfly Parasite (*Alysia manducator*).
(1) Head of adult female. (2) Adult male. (3) Larva (last instar). (4) Pupa. (5) Blowfly puparium containing Alysia pupa within its silken cocoon. (6) Front view of mouthparts of last larval instar. (7) Eggs dissected, from the ovary.

wriggling violently for the first few seconds after the ovipositer is inserted, then becoming paralysed for from three to six minutes. The eggs are deposited singly in the maggots, only one parasite hatching from each parasitised pupa. The egg is laid in any part of the body, but most frequently the posterior portion is selected. The parasite is then able to lie clear of the violent wriggling of the maggots. Parasitised maggots pupate from one to six days after oviposition has occurred.

The dissection of twelve females by Alston gave an average of 366 eggs per female, the largest number recorded being 416. In Sydney, with a limited supply of maggots, thirty-three females have given an average of seventy-five progeny per female, whilst the maximum progeny from a single female was 250.

As the result of observations extending over a period of three years, Graham-Smith estimates the average parasitism by *Alysia manducator* in the field in England to be 43 per cent. in the autumn and 10 per cent. during the summer.

History of the First Introductions of Alysia into Australia.

Early in 1924 Mr. W. B. Gurney wrote to the Imperial Bureau of Entomology, London, asking if *Alysia manducator,* a European Braconid wasp formerly recorded by Professor Lefroy as a valuable blowfly parasite, could be recommended for New South Wales. A favourable reply having been received from Dr. Marshall, the Director, immediate approval was obtained (October, 1924) for this parasite to be forwarded, and accordingly thirty-three blowfly pupae were received by post in Sydney in January, 1925, and 3,466 maggots and pupae per s.s. *Oronsay* arrived in March, 1925. Not one parasite hatched from the larger batch, but ten *Alysia manducator* hatched from the thirty-three received by post. Although fed carefully, they failed to parasitise any of the maggots of the house fly or of *Calliphora erythrocephala* or *Lucilia sericata,* which were presented to them.

Further parasitised pupae were asked for, and three batches were received from England between the 23rd November, 1926, and the 24th January, 1927. The numbers of parasites (*A. manducator*) which were hatched from these are indicated below. It will be seen that three generations of the parasites were developed here before they died out. Both in these generations and in the subsequent development of the parasite under laboratory conditions there was a tendency towards the production of excess of males over females. It was definitely demonstrated by the Entomologist, however, that the parasites would develop in the smooth-bodied blowfly maggots of such species as *Lucilia sericata, &c.,* and that they failed to parasitise, in the cages, the tougher-skinned, hairy maggots of *Chrysomyia rufifacies.*

No further parasites were received by the Entomologist during 1927, but on the 9th January, 1928, 500 parasitised puparia were received per the s.s. *Jervis Bay.* From these were developed 371 parasites (*Alysia manducator*) by the 6th February. Numbers of blowfly maggots were

presented to the majority of these, and some 400 parasitised pupae were obtained. It was then decided to liberate the remainder in the field rather than risk mishap during development in the cages; therefore, the Entomologist, with his assistants, Messrs. McCarthy and the writer, liberated thirty-two adult *Alysia manducator* at Gundy, near Scone, New South Wales, on the 5th February, 1928. They were placed under a cloth-and-gauze cage with maggot-infested rats and rabbits, and two days later the cage was opened to allow the escape of any parasites or their progeny on hatching. Under the same cage the 400 parasitised pupae were set out on 21st February. It

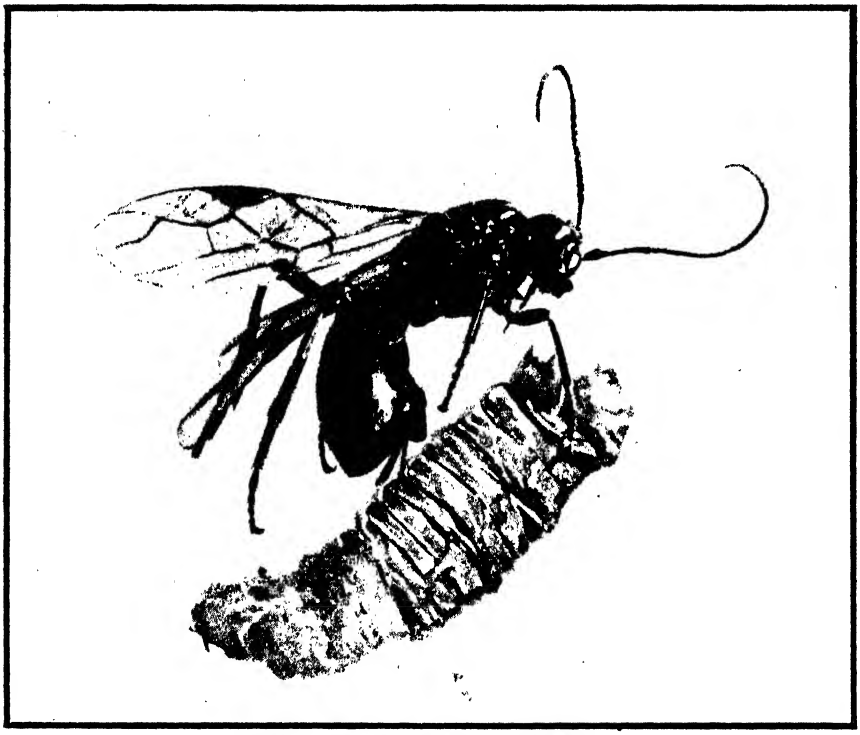


Fig. 2.—Female "Stinging" the Maggot.

was noted that numerous Histerid beetles (*Saprinus laetus*), and certain carrion-infesting Staphylinid and Dermestid beetles swarmed onto the carcases set out under the cage where the parasites were liberated. It is considered certain that a considerable number of parasitised pupae were destroyed by the Histerid beetles. It is in spite of such natural enemies, however, that any introduced parasite will need to survive if it is to successfully establish itself and increase in Australia.

At this time, as had been done on an earlier occasion, the Entomologist asked the Imperial Bureau of Entomology to record and forward to him any other internal parasite of Muscoid flies, or any useful predatory insect

which might conceivably be effective in New South Wales, and which would contribute further towards control of blowflies, even should he succeed in establishing *Alysia manducator.*

The Establishment of Alysia in the Sydney Laboratory.

Following the Scone liberations, a further batch of ninety puparia was received in Sydney from England in May, 1928. From these puparia twenty-nine parasites hatched, only twenty-one of which were vigorous. A successful establishment of the parasite in the laboratory was made by the writer from these twenty-one vigorous parasites, and continuous breeding operations have now been maintained for the past eighteen months (June, 1928, to November, 1929).

The twenty-nine parasites that hatched from this batch of ninety puparia were liberated in the laboratory on rabbit carcases heavily infested with well-grown maggots of *Lucilia sericata.* After exposing the maggots to the parasites for three days, they and any other maggots which had pupated were collected and placed in moist soil in breeding cages. During the cold weather in June much difficulty was at first experienced in maintaining supplies of maggots of *Lucilia sericata.* Regular supplies were, however, obtained by placing carcases which had previously been infested with eggs of *L. sericata* in an incubator at 72 to 74 deg. Fah., well-developed maggots being produced within three days.

Number of Generations Bred.

From the original batch referred to seven complete generations have now been bred, while the eighth is almost complete, and the ninth partly so. The periods of emergence for these generations are given in the following table:—

The Generation.	*Periods of Emergence.*
The 29 parasites that hatched from the 90 puparia ...	22 May, 1928, to 15 June, 1928.
No. 1	18 July, 1928, „ 14 August, 1928.
No. 2	10 Sept., 1928, „ 2 November, 1928.
*No. 3	12 October, 1928, „ 18 December, 1928.
No. 4	3 Dec., 1928, „ 26 February, 1929.
*No. 5	9 January, 1929, „ 15 April, 1929.
No. 6	5 Febr., 1929, „ 21 May, 1929.
No. 7	3 June, 1929, „ 27 July, 1929.
No. 8	26 July, 1929 (not completed).
No. 9	18 Sept. 1929 (not completed).

* A preponderance of males occurred in these generations.

Breeding Methods.

For the first six generations the supply of maggots was developed in purchased rabbit carcases, but for the last three generations rabbits' heads were made available for this work through the courtesy of Messrs. Wade Bros. & Co., Hay-street, Sydney, and proved very satisfactory.

The first three generations were developed in maggost of *Lucilia sericata,* but any smooth-bodied maggots infesting freshly-exposed carcases have since been employed. Cheap and effective receptacles are employed for

exposing the maggots to the parasites. These consist of kerosene tins which have the centre portion of the tops cut away so as to leave a 1-inch flange around the opening to prevent the escape of the maggots. About 6 or 8 inches of soil is placed in each tin, and the maggot-infested heads suspended in the tin above the soil by means of wires. The maggots drop and burrow into the soil and pupate; thus they are largely protected from attack by the chalcid *Mormoniella* (*Nasonia*) *brevicornis*, which is a super-parasite of *Alysia manducator*, and which has on occasion destroyed large batches of puparia parasitised by *Alysia* and inadvertently exposed to its attack. The contents of the tin are not disturbed until after all the flies from unparasitised pupae have hatched. The parasitised pupae, together with other litter, are separated from the soil by floating them off in water. The

Fig. 3.—Netting-Cage used in Liberating the Parasite.

pupae are then placed in glass-topped boxes and covered with an inch of fine soil to protect them from infestation from any *Mormoniella brevicornis* which might hatch out and destroy pupae bearing *Alysia*.

Preponderance of Males Hatching in Certain Generations.

In the third generation of the *Alysia* a large preponderance of males hatched. This is thought to have been due to the fact that the second generation had been kept during cold, dull weather in a large cage (18 inches x 18 inches x 12 inches) until such time as a further supply of maggots was ready, and that copulation was not occurring readily under these conditions. This was deduced from the fact that Alston demonstrated that unfertilised *Alysia* females give rise to males only. Means were therefore devised to ensure copulation. The females of *Alysia manducator* are entirely passive, evincing no desire to copulate, their presence merely stimulating the males to sexual activity. The close proximity of males and females in glass tubes (4 inches x ¾ inches) gave better results, especially

when the tubes were placed in sunlight. Therefore, the practice adopted since has been to place the females with males in glass tubes for at least several hours before allowing them to oviposit in the maggots. Even in the tubes the males do not always copulate readily. In such cases it has been found advantageous to segregate the sexes for at least a day. On placing them together again copulation occurs much more readily.

The reason for the preponderence of males in the fifth generation cannot be definitely explained, but possibly it was due to the torpor of the males of the previous generation, which seemed to have been induced by a spell of extremely hot weather. Moreover, at this particular time the parasites received less attention owing to the pressure of other official work. This reduction in the proportion of females considerably retarded any increase in the number of parasites. In view of this it was deemed necessary to make some tests to determine whether the male progeny of a single female (in cases where the progeny are all males) were capable of fertilising females. Ten males were used in the test and mated with normal females. One copulation resulted in the production of male and female progeny. Two other copulations resulted in the production of all males. Of the remaining seven males, it was not absolutely certain whether copulation had occurred, but the female's progeny proved to be all males. Conversely, however, all male progeny resulted from copulation between a virgin female and a male selected from progeny of a single female in which there were approximately males and females in equal numbers. The same conditions of temperature and humidity prevailed in all these tests. It would appear, therefore, that failure to copulate may not be the only factor conducive to the production of an all-male progeny, and that such males, as proved in one case at least, are capable of fertilising females.

Seasonal Influences on the length of the Life-history.

Under room temperature in the Sydney laboratory the minimum period for the development from the egg to the adult has been twenty-five days, while the maximum has been more than 100 days. The average period is thirty-five days in summer, forty-five days in autumn and spring, and sixty-five days during the winter. In England it is recorded that the parasite has a distinct over-wintering period, and maggots parasitised late in the autumn produce adult *Alysia* in the spring and in the following autumn in the proportion of one-third in the former period and two-thirds in the latter. This would mean that two-thirds of the parasites lie dormant in the parasitised pupae over a period of nine to ten months. There is every indication, however, that the habits of the parasite will be considerably altered under New South Wales climatic conditions. No distinct lengthy dormant period, such as indicated above, even in the winter, has occurred during the past two Sydney winters and one summer. There has been, however, a slowing-down of development during cold months, the average period for the coldest part of winter being seventy-five days.

The variations in the periods of time for development from egg to adult at different seasons are indicated below:—

Date of Oviposition.	*Minimum period of Development.*	*Date of Oviposition.*	*Minimum period of Development.*
1928.	Days.	1929.	Days.
28 May	50	3 May	32
26 July	45	6 May	36
27 September	42	15 May	39
2 October	37	23 May	42
1929.		14 June	60
8 January	28	21 June	51
11 January...	25	22 July	42
25 March	37		

In the colder months, viz., middle of May and middle of August, the parasitised maggots pupated in Sydney two to six days after parasitism, whereas it was observed that the great majority of the non-parasitised maggots did not pupate for weeks or even months, remaining as maggots right through from the middle of May until the middle of August. The flies from these maggots hatched towards the end of August, but the *Alysia* parasites from eggs deposited during the earlier winter (from 15th May, 1929, to 14th June, 1929) hatched before the end of August. However, *Alysia* eggs deposited after 14th June, 1929, hatched after the blowflies.

Should *Alysia* become established in the field much of its value as a blowfly parasite must rest in the fact that it can develop and reproduce readily during the cooler months. The development of *Alysia* during the winter here is slowed down, but its fecundity has been found to be greater at this time than during the hot summer months.

Habits and Methods of Oviposition.

Alysia females display extreme pertinacity and endurance in working among the deepest filth of a carcase in search of suitable maggots to parasitise, their wings being bedraggled with slime while they still continue to oviposit until completely exhausted. However, females hopelessly bedraggled with slime, and appearing almost exhausted when taken from carcases where they had been ovipositing for three to four hours, have cleaned themselves up overnight, being quite normal in appearance and vigour the following day.

In its natural habitat, *Alysia* (both male and female) are attracted to fresh carcases even before maggots have developed and wait there until such time as maggots are ready for infestation. Myers states that *Alysia* will not oviposit in maggots in faecal matters, and but little in maggots subsisting on offal consisting chiefly of visceral remains. The possibility, once mooted, that *Alysia* might infest certain Syrphid fly maggots or even Tachinid fly maggots is very remote, as these flies are not associated with carcases.

Hosts.

Alysia has been recorded on the following dipterous hosts by Dalla Torre (*Cat. Hymen.* IV, 1898; page 46, note 2):—*Lucilia caesar* L., *Muscina stabulans* Fall., *Hydroptoea dentipes* F., and a Coleopteron, *Creophilus*

Maxillosus L. Alston recorded the following hosts:—*L. sericata* Meig., *L. Caesar* L., *Phormia groenlandica* Ztt., *Callipora erythrocephala* Meig. and *C. vomitoria,* L.

In the laboratory in Sydney *Alysia* has been bred from maggots of *Calliphora stygia, C. augur, C. erythrocephela,* and *Lucilia sericata.* Best results have been obtained with *L. sericata* and *C. erythrocephala.* Several attempts have been made to develop *Alysia* from hairy maggots of *Chrysomyia rufifacies,* but only a single parasite has been bred from the large numbers of maggots offered. *Alysia* was usually unable to pierce the cuticle of these maggots with its ovipositor, and, when successful, was unable to withdraw the ovipositor readily, frequently being pulled in among the wriggling mass of maggots. In the field, however, oviposition in fully-grown maggots of *C. rufifacies* in sheep carcases appeared to be more easily accomplished. In the laboratory where both the rough *Chrysomyia* and the smooth type of maggots occurred together, *Alysia* confined its attention to the smooth maggots after one or two unsuccessful attempts to sting the rough hairy type. Negative results have been obtained by exposing maggots of *Sarcophaga* sp. to *Alysia,* and no definite record has been obtained of successful parasitism of maggots of *Ophyra* species.

Field Liberations.

From the parasites which have been established in the Sydney laboratory several field liberations have been made during the past twelve months in a number of selected localities throughout the State. Thus liberations were made in the open at three departmental experiment farms, viz., Trangie (120 parasites), Glen Innes (580), and Coonamble (150). In addition, several thousands of parasites have been liberated on the following private holdings:—Australia and New Zealand Land Co.; Walhallow Station, Quirindi (1,500 parasites); F. W. Forster and Sons, Abington, Armidale (450); R. A. W. Vickers, Wilson's Creek, Uralla (300); the Deepwater Estate, Deepwater (700); A. H. Jeffreys, Delegate Station, Delegate (1,200); and A. M. Wright, Tombong, Delegate (1,000).

The Department desires to acknowledge the courtesy and ready co-operation of the owners of the these properties in providing sheep carcases and in covering them with wire netting for our liberations.

So far a total of 6,000 parasites have been liberated, and these are being rapidly supplemented by further supplies. A number of parasites have also been liberated in two localities in Sydney, the entomologist considering that as *Calliphora erythrocephala* was rather more prevalent on the coast and that the rainfall was higher than inland, establishment might be more readily obtained there.

In all these field liberations the females of *Alysia* have commenced ovipositing almost immediately they were liberated, making no attempt to leave the maggot infested carcases. With the exception of the first six field liberations which were made at Walhallow, Quirindi, all the carcases

have been heavily infested with the smooth types of blowfly maggot, extensive breeding operations being inaugurated in the laboratory during the autumn of 1929, in order to ensure the emergence of large numbers of *Alysia manducator* at a time when the smooth maggots would be most abundant in the field. About a month after the initial liberations in each locality carcases are set out so as to provide a ready supply of maggots for any parasites emerging. From 120 to 1,500 parasites have been liberated in each of the localities under a variety of weather conditions.

Attempts to recover the parasite in the field are being made at the present time. It is anticipated that the climate and weather conditions of the coastal districts and the tablelands will be more conducive to the establishment of the parasite than perhaps the drier western districts.

Factors Influencing Successful Establishment in New South Wales.

The main factors likely to militate against the successful establishment of *Alysia manducator* under New South Wales conditions are the following:—

1. The continual dry nature of the soil during several months of most years. In the laboratory there was considerable mortality of parasites in pupae in very dry soil. The soil beneath a carcase is usually fairly damp, and although the majority of smooth maggots pupate several feet from the carcase, sufficient parasites may develop in pupae in the soil beneath the carcase to tide it over the summer months.

2. The vigour of the adult may be reduced during the summer months, there being some indication of this in the laboratory during the summer of 1928-29, when temperatures were high and atmospheric conditions dry.

3. *Mormoniella brevicornis* parasitises, freely, pupae already bearing the *Alysia* parasite, but as *Mormoniella* is a pupal parasite and many maggots are able to hide or bury themselves in the soil, a percentage of the *Alysia* should emerge. The present indications are that *Alysia* will either confine its attentions to, or show a distinct preference for, the smooth type of maggots, the large majority of which pupate in the soil and are thus protected from *M. brevicornis.* If, however, *Alysia* should more readily infest *Chrysomyia rufifacies* maggots, the majority of which pupate above ground, super-parasitism by *Mormoniella* will most certainly check its increase very considerably unless *Alysia* parasitism should stimulate the maggots to pupate beneath the surface of the soil. It is not known whether *Alysia* will breed in the maggots of *Microcalliphora varipes.* It is interesting to note that Alston is of the opinion that super-parasitism by *Mormoniella* is a negligible quantity in the field in England.

4. In the drier western portions of the State the smooth type of maggot is scarce during the summer months, although it is more numerous in the moister parts of the tablelands and on the coast.

5. The several species of predatory beetles, notably the Histerid *Saprinus laetus*, are likely to cause heavy parasite mortality by feeding on the pupae. Other predatory beetles, such as *Creophilus erythrocephalus*, &c., as well as ants which attack adult *Alysia*, are all factors operating against the successful establishment of the parasite under Australian conditions.

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"The Composition of Pastures."

Many will doubt the satement that the Empire's richest crop is grass, while to suggest that we are a nation of grass-eaters is likely to invite ridicule. However, according to a report on pasture research ("The Composition of Pastures," by J. B. Orr, Director of the Rowett Research Institute) consumption of live stock products in the United Kingdom is estimated at about £400,000,000 per annum, as compared with £100,000,000 in the case of wheat. The truth in the first sentence should therefore be apparent, seeing that pasture is the raw material used in the "manufacture" of milk, meat, mutton, wool, hides, and other live stock products. In fact, in many pastoral areas it is the only raw material used, and even under the conditions of intensive production as in England, it is estimated that pasture constitutes three-quarters of the material consumed by grazing animals.

The importance of improving our pastures and of restoring those that have been allowed to run down is being more and more widely recognised, and any fresh contribution on the subject is always welcomed. But Dr. Orr's report has a more direct interest for Australian research workers in that a good deal of the work reported upon was carried out in this country, as the result of arrangements between the Empire Marketing Board and the Commonwealth Council for Scientific and Industrial Research. Perhaps its greatest appeal, however, will be on the grounds that it is the first general account of research work directly bearing on the composition of pastures.

Our copy direct from the Empire Marketing Board.

The Care of Honey Extracting Utensils.

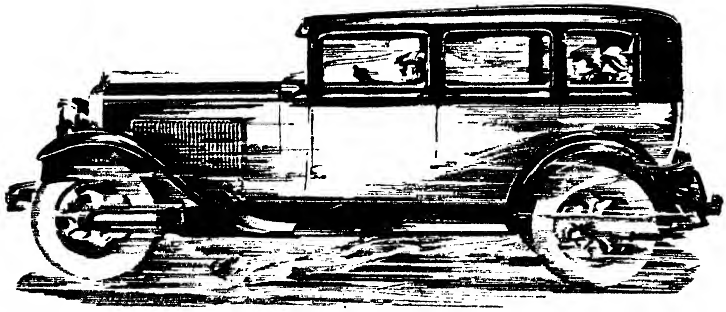
H. GRAHAM SMITH, Apiarist, Hawkesbury Agricultural College.

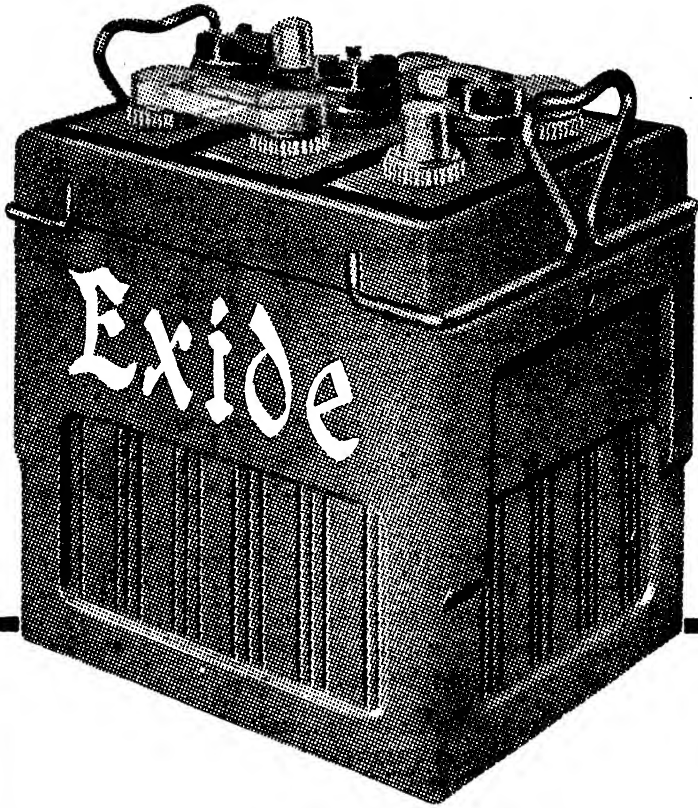
HONEY is the product of one of the most highly-skilled and hygienic communities known, and is naturally pure, rich, and wholesome. Beekeepers, in all their operations, should endeavour to keep it so. In this connection, two things at least are necessary, viz., the strictest cleanliness in robbing and extracting operations, and the use of clean utensils.

Dairymen quickly realise when they receive smaller cheques from the factory that the standard of their cream has fallen, due mostly to some micro-organism, and they soon set about finding the cause, and subsequently the remedy. No such accuracy, as yet, is exacted from honey producers. Only recently, however, a shipment of honey was returned from Germany to America as "impure honey," because the diastatic element of the honey had been impaired by heating. Unlike milk, honey does not lend itself to easy contamination through development of micro-organisms, but that fact does not mean that the apiarist is at liberty to adopt faulty methods, and at the same time not endanger the quality of his honey.

Next to cleanliness in handling honey, the care of utensils and containers used in extracting and storing, and in which it is eventually sold, is most important. Extracting appliances and tanks, unless well cared for during the period when not in use, are more inclined to rust out than wear out. These are usually more or less idle during a considerable period of each year. The first care, therefore, is to see that such appliances do not get into a condition that is likely to impair the natural purity of the honey. Damage in this respect is most likely to occur from the use of old model extractors in which the quality of material in the tank and baskets is poor compared with the mechanical parts, with the result that the latter usually give good service for years after the former have rusted and become unfit for use. In many cases, the beekeeper, reluctant about scrapping a machine that is mechanically sound, continues to use it with damaging results.

The galvanised coating or tinning, as the case may be, on extractors and tanks, in process of time, wears off in patches, perhaps only the size of pin-points, and exposes the iron beneath. These patches gradually increase in size, and the chemical action of the honey coming into contact with such exposed parts, minute though they be, results in tannate of iron being formed. This substance, which is really the basis of ordinary writing ink, is black, and where it is allowed to get into honey results in permanent damage. In the case of slightly rusted apparatus, the detrimental effects will be minimised if those parts that come into contact with honey be coated with beeswax. The most satisfactory method, however, is to have the rusted parts re-tinned or re-galvanised. There is one objection to this treatment

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in that soldered parts come undone in the process and have to be reassembled. This makes the cost of reconditioning rather higher than one would expect. Nevertheless it is cheaper than replacing with new parts.

A number of inquiries have been made concerning the use of paint for restoring the condition of honey extractors and tanks internally. This is not recommended in view of the possible chemical reaction of honey when brought into contact with a painted surface. There is also the risk of damaging the honey, or still more serious, of introducing some of the poisonous ingredients in the paint.

When not in use, extracting apparatus should be thoroughly washed with hot water, dried, and covered so as to be free from moisture or dust. Depreciation will thereby be reduced to a minimum, which means a longer life for the apparatus and a higher standard of quality in the honey.

Buy Australian-grown Products.

It is not generally realised that over eight and a half million pounds worth of foodstuffs are imported annually into the Commonwealth, of which amount five million pounds represents products that can be produced in this country. . . . It should be the aim of every member of the Agricultural Bureau to reduce such imports as bacon and pork (£100,000) and cheese (£45,000). A good deal can be accomplished by members using only Australian goods.—W. W. Watson, General President of the Agricultural Bureau, at the recent Illawarra District Conference.

"The Scientific Principles of Plant Protection."

Although admitting that it is a difficult task to estimate the total annual loss occasioned by crop pests, Sir E. J. Russell recently ventured the opinion that it was not less than £15,000,000 to £20,000,000 a year in Great Britain. Seeing that progress in pest control has made such strides in recent years, it would be useless to deny that money spent in furthering such work—being mindful of the staggering losses mentioned above—was not wisely used.

Mr. Hubert Martin, in his recently published book, "The Scientific Principles of Plant Protection," claims that the field of investigation in regard to pest control has become so extensive as to call for not only increased expenditure, but closer co-operation between the entomologist, mycologist, chemist, and plant physiologist, and the primary object of his work is to assist these workers to co-operate to the best advantage by supplying a comprehensive survey of the scientific principles underlying pest control methods, so as to present to the entomologist and mycologist a view of the chemical and physical aspects, and similarly to the chemist and physicist a means of approach to the biological side. Detailed consideration is given to all known methods of control, or "plant protection," as the author terms it, including fungicides and insecticides, fumigation, parasites, breeding resistant varieties, soil treatment to improve the constitution of the plant, and seed treatment.

Our copy from the publishers, Messrs. Edward Arnold and Co., London.

The Influence of the Dairy Industry Act on Cream Quality.

L. T. MACINNES, Director of Dairying.

UNDER the provisions of the Dairy Industry Act, 1915, power is given to exercise supervision and control over the vehicles used for public hire to convey cream from farms to factory. Formerly, these conveyances were often without coverings, and the milk or cream so carried was exposed to the hot rays of the sun and thereby detrimentally affected as to quality.

Fig. 1.—Before

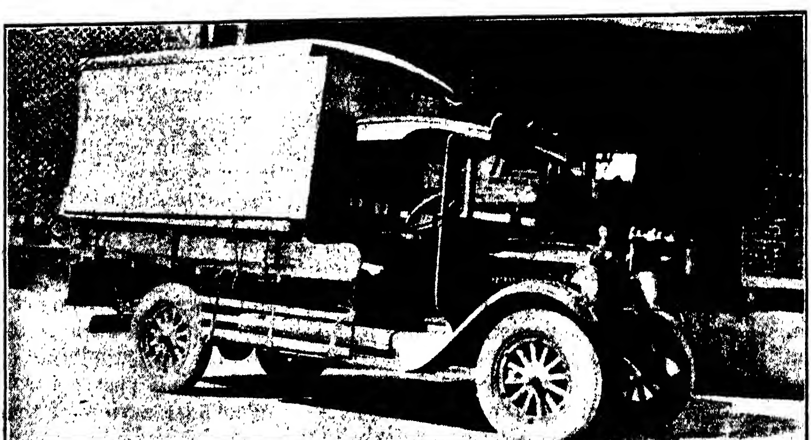


Fig. 2.—And After.

In many cases where coverings were provided they were of such a nature as to do more harm than good. An instance of such a case is illustrated by the conveyance here depicted (see Fig. 1), which was used by a

carrier on the North Coast, who was last year ordered to provide a conveyance of the standard required under the Dairy Industry Act. The result is shown in the Fig. 2.

This improvement in means of transport is a big factor in bringing about that higher standard in butter and cheese quality so desi.ed and striven for by the Department of Agriculture, and by all those who have the true interests of the dairying industry at heart.

The accompanying illustrations also demonstrate the effectiveness of the methods of the Dairy Branch in improving conditions for the dairy farmers, when power is given it under the Dairy Industry Act.

FEEDING AND MILK PRODUCTION.

DISCUSSING the question of increased productivity in the dairy industry. C. W. Larson, of the National Dairy Council, states that while with a machine it takes twice the amount of raw material to make twice the product, from an actual study of 100,000 cows of which complete records had been kept it was found that cows producing 9,000 lb. of milk, which is about twice the average production in U.S.A., actually consumed only 40 per cent. more feed.

IMPROVING THE MILK-PRODUCING CAPACITY OF A HERD.

CAREFUL selection and grading appear to be the best policy to improve the milk-producing capacity of a herd, states Santokh Singh, in dealing with the question of inheritance of milking capacity in pedigree shorthorns (*Journal of British Dairy Farmers' Association*). The basis of selection, he continues, should be the continual good performance on both the sire's and the dam's side of the individual selected, provided, of course, that constitution is maintained and the good looks or breed characteristics are not lost sight of. Therefore, a bull selected to grade up the herd for milk production should be descended on both sides from healthy ancestors of high milk-producing capacity and good breed type. But the final judgment on the merit of the bull should be delayed till the performance of his progeny is known. Similarly, a heifer selected for the herd should be descended from high producers of the desired type on both sides of the ancestry, in order to stand a good chance of getting progeny possessing high milk-producing qualities.

HOW THE MADRAS DEPARTMENT EDUCATES THE FARMER.

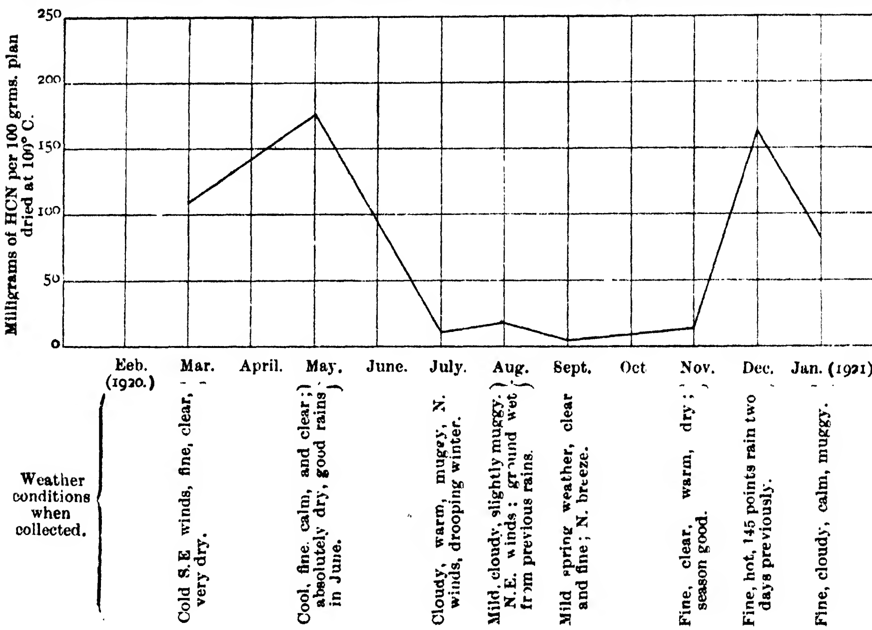
THE Madras Department of Agriculture claims that they have discovered something better than a "better farming train" as a medium for conveying their teachings to the farmer. They have put on the road a travelling motor exhibition. This is considered an improvement on the exhibition train idea in that it is possible for the motor van to visit a lot of centres through which no railway line passes. Moreover, it is only at important towns and centres (in India) that facilities exist for halting a long train in a siding without dislocating the traffic.

Rosewood (*Heterodendron oleaefolium*) and Native Fuchsia (*Eremophila maculata*)—Two Poisonous Plants.

A. A. RAMSAY, F.C.S., F.A.I.C., Chief Chemist, and
MAX HENRY, M.R.C.V.S., B.V.Sc., Chief Veterinary Surgeon.

THE following account of investigations into the poisonous properties of rosewood (*Heterodendron oleaefolium*) and native fushia (*Eremophila maculata*), which were undertaken some years ago, but not previously reported, is of interest in view of the present-day researches on the subject of poisonous plants.

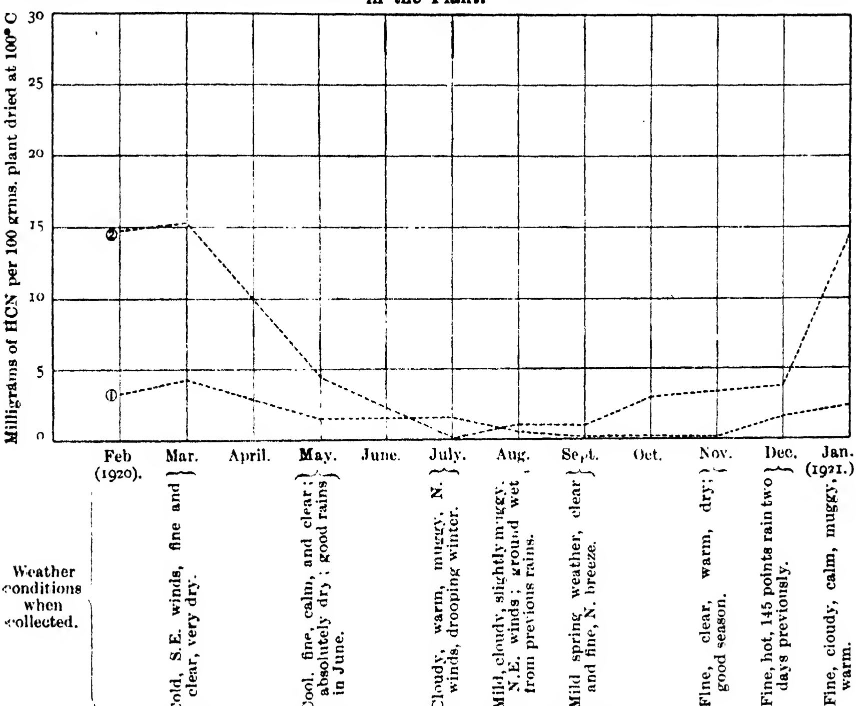
NATIVE FUCHSIA (*Eremophila maculata*)—**HCN Liberated without the use of Almonds.**



In 1920 a stockowner in the Nyngan district reported that he had lost sheep after feeding on rosewood, which had been lopped as scrub feed for sheep. He had been hand-feeding for twenty-two months, and had several times lopped all rosewood trees on his holding. About three weeks to a month before reporting he cut some, carried it to the house paddock, and put some down for the sheep to eat. There was nothing else in the paddock for them to eat. Three hours later four sheep were dead and seven down. He immediately had the sheep driven away from the rosewood, collected it, and burnt it. No more sheep were affected.

Material was obtained from the same group of trees by one of us (M.H.), and attempts made to feed it to four very hungry sheep which had been on short commons for four days but were strong. They quite refused to touch it. A specimen was supplied to the then Departmental Chemist (Mr. F. B. Guthrie), who reported that it contained prussic acid. The then Government Botanist (Mr. J. H. Maiden) identified the plant as *Heterodendron oleaefolium,* commonly known as western rosewood.

ROSEWOOD (*Heterodendron oleaefolium*)—**Prussic Acid Liberated by Enzyme Naturally Present in the Plant.**



Key : (1) Heterodendron oleaefolium (old growth) over 12 months old.
(2) ,, ,, (new growth) under 12 months old.

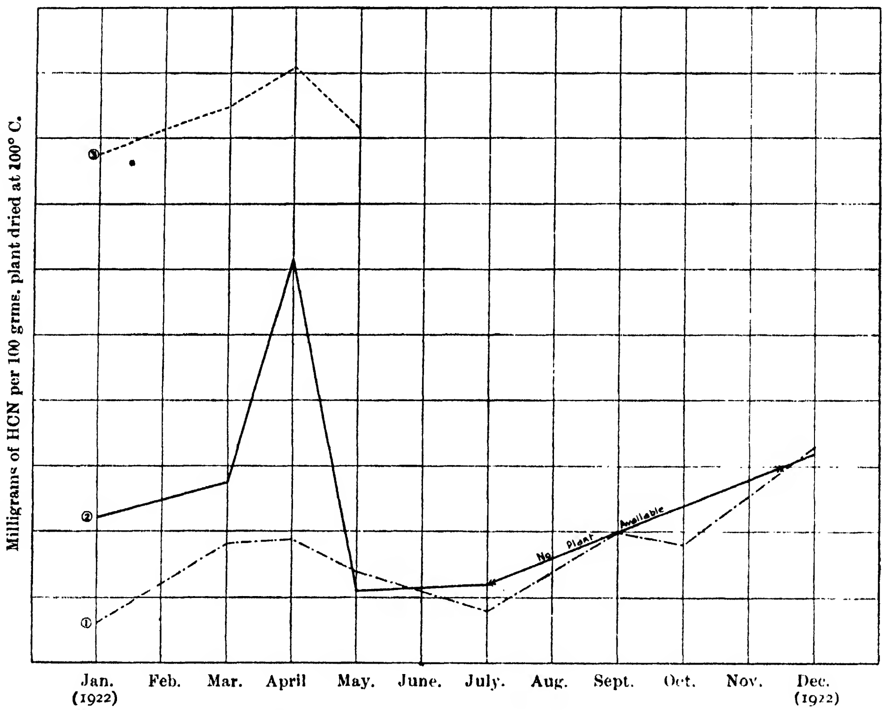
As at the same time a plant known as wild fuchsia, identified as *Eremophila maculata,* and which had often been held to poison stock, was also available in the same district, arrangements were made for the local Inspector of Stock (Mr. E. A. Lucas) to forward samples to the Chief Chemist for the quantitative determination of hydrocyanic acid. The work of forwarding specimens was later continued by Mr. H. G. Belschner, B.V.Sc. The material sent for examination consisted of new and old growth (over twelve months old) of rosewood and fuchsia bush.

The objects of this investigation were:—

1. To determine the month or months during which the shrubs yielded their maximum amounts of hydrocyanic acid.
2. To determine, if possible, the effect of weather conditions on the amounts of hydrocyanic acid yielded by the plants.

The figures recorded for the plants examined during 1920-21 represent the hydrocyanic acid liberated by the enzymes occurring naturally in these plants. As there is not sufficient enzyme naturally in these plants to decompose all the cyanogenetic glucoside present, the hydrocyanic acid obtained under these conditions does not represent the maximum yield, but it was considered that these figures would give a good idea of the maximum

ROSEWOOD and NATIVE FUCHSIA—Prussic Acid Liberated by the Plant Enzyme Assisted by Pulverised Sweet Almonds (free from HCN).



Weather conditions very dry throughout the year.

Key:—

(1) —·—·— Heterodendron oleaefolium (old growth) over 12 months old.
(2) ——— ,, ,, (new growth) under 12 months old.
(3) ······· Eremophila maculata.

yield to be expected under ordinary feeding conditions. The figures for hydrocyanic acid recorded for the year 1922 were obtained by the addition of an enzyme in the form of milk of almonds (free from hydrocyanic acid) to the plant in sufficient quantity to decompose all the cyanogenetic glucoside present, and so represent practically all the hydrocyanic acid. Altogether forty-five determinations were made. The results are set out in the foregoing graphs.

An examination of these graphs shows:—

1. That in all cases the yield of hydrocyanic acid reaches its maximum in the late summer and early autumn (March, April, May), falls to a minimum during late winter and early spring (July, August, September), and begins to increase again about November of the same year.
2. That *Eremophila* (fuchsia bush) yields a greater percentage of hydrocyanic acid than does *Heterodendron* (rosewood).
3. That new growth rosewood yields a larger percentage of hydrocyanic acid than old growth (over twelve months old).

The investigations did not reveal any marked effects of weather conditions on the amount of hydrocyanic acid yielded by the shrubs.

The chemical work for this article was carried out by the Senior Chemist, Mr. E. Griffiths, B.Sc.

A Weed Control Campaign.

Anticipating the whole-hearted support of country newspapers, the Department of Agriculture has launched out on a campaign of instruction in regard to noxious weed control and identification. Every country newspaper man in New South Wales has had the scheme explained to him by letter, and for the information of readers the idea is set out briefly hereunder.

A series of articles will appear in the *Agricultural and Pastoral Notes*, which is a publication of the Department containing articles on topical agricultural subjects, which country newspapers are asked to reprint for the information and guidance of their farmer readers. The service is quite free, and is only available to country papers and not to individual farmers, with the result that unless your local paper reprints the matter it will be lost to you. It is in this connection that readers can assist by impressing upon the local editor the importance of making full use of this service.

That these *Notes* contain valuable information there can be no denying. The articles are contributed by officers of the Department and are based on practical experience. With particular reference to the series of articles on weeds, not only will these contain particulars of the most up-to-date methods of control, but they will be illustrated in order to enable farmers to identify the various noxious weeds with a greater degree of certainty than many are able to do at present. Stereos of these blocks will be loaned, free of charge, to country papers, so they can have no objection to reprinting the articles on the score of expense.

Not only farmers, but teachers, school children in rural districts, and others, are interested in weed identification and control, and it only remains for country newspapers to feature the articles to ensure the success of the campaign.

Turkey Raising at Hawkesbury Agricultural College.

C. LAWRENCE, Poultry Instructor, Hawkesbury Agricultural College.

TURKEY raising in the coastal districts has not proved generally satisfactory, and very few turkeys are raised within 100 miles of Sydney. This is partly owing to the fact that a large area of land is required on which to run them, and also because of the prevalence of the disease entero-hepatitis (blackhead). During the past few years, however, turkeys have been successfully raised at Hawkesbury Agricultural College, and flocks of up to 300 birds have been reared with a low rate of mortality. The methods adopted in the hatching and rearing are given in the following outline of operations at the College. The American Bronze is the breed kept, it being the only breed handled in any numbers in this country.

Management of Breeding Stock.

In selecting turkeys for breeding purposes, only well-matured birds, possessing good constitution and vigour, free from all body deformities such as crooked legs and breast-bones are chosen. These latter two faults are common in turkeys and should be carefully avoided. A selection is made of birds having the greatest length from the head to the tip of the tail, also thick, sturdy, straight shanks and a well-made frame, together with good health as denoted by the bright red caruncles on the head. Short legged, stumpy birds are avoided, as these are not likely to produce good heavy turkeys.

Care is taken to avoid too close a relationship between birds used for breeding, because the vitality of the flock is quickly lowered by inbreeding, the young poults are difficult to rear, and cripples are numerous. Excessively heavy gobblers are avoided because of the possibility of injury to the hens in the breeding-pen. A gobbler weighing about 36 lb. when two years old is as heavy as it is advisable to use. Large hens, however, should be selected to mate with such a bird. A practice is made of trimming the spurs and toe-nails of the older gobblers before the breeding season. The number of hens usually mated to each male depends upon the age and activity of the bird, but for an active two-year-old gobbler fifteen females are usually placed in the pen. This is the maximum and in some cases it might be found necessary to reduce the number of hens. This applies particularly where the male bird is more than three years old. Where it is desired to effect any particular improvement in the stock smaller matings are preferred, as it is easier to secure more uniformity in a small pen than in a large one.

Turkey hens, like fowls, lay best in their first year, and production decreases each year so that it is unprofitable to keep them after three years. Usually turkeys lay three clutches of eggs in the season, the first clutch

averaging about eighteen eggs, the second twelve, and the third ten. Where it is desired to continue hatching throughout the season, the hens are not allowed to sit and hatch their own eggs, because a less number of eggs would be available for hatching. The practice is to take the eggs away as they are laid, only one egg being left in the nest as a "nest egg," and when a bird becomes broody she is confined to a coop or small pen and allowed to remain there for a few days, after which she is given her freedom and usually commences to lay again in a short time. In some cases the turkey hens are allowed to hatch out the third clutch of eggs. By doing this the maximum number of young turkeys are hatched and the breeding season is not prolonged. Quite a large flock of birds may be

A Breeding Pen at Hawkesbury Agricultural College.

built up in this way during the season from a small breeding-pen. The eggs are collected twice daily to prevent the risk of incubation commencing, which would be likely to occur if they were allowed to remain under the broody hens. The eggs are stored in a cool place until they are ready to be used for hatching.

Hatching.

Hatching is done either by incubators, turkey hens or ordinary hens, according to circumstances. When turkey hens are used they are given eighteen to twenty eggs, and ordinary hens, according to the size of the bird, ten to twelve eggs being careful to give no more than the birds can comfortably cover. On free range turkey hens make their nests in a secluded spot, but as crows often find the nest before the attendant every effort is made to induce the birds to lay in nests provided for them, and to this end attractive nests are placed in close proximity to the outbuildings. At Hawkesbury Agricultural College half-round sheets of galvanised iron

are used for the nests and these are placed side by side abutting a fence, the fronts being screened by piling brush around so that the hens have the desired seclusion. Straw or pine needles are provided for nesting material, and often three or four hens lay in the same nest. The hens usually commence to lay in June, and indications of laying are restlessness, together with a croaking noise which they make when wandering about searching for a place to make their nest. The caruncles on the head and neck also become a brighter red in appearance.

Excellent results are obtained at the College by hatching with incubators and rearing the young poults with ordinary hens or lamp-heated brooders. The practice, when using hens, is to have a number of broody hens ready two or three days prior to the incubator hatching, and then two or three

Young Turkey Gobblers on free Range.

eggs are taken from the incubator and placed under the broody hen. This accustoms them to the process of hatching and they are quite content to adopt the young poults hatched in the incubator. No more than fifteen are given to each hen. Eggs which are to be hatched by incubator are not kept more than nine days before setting, but when set under an ordinary hen or turkey, fair results are often obtained from eggs much older, provided reasonable care has been taken in storing them away from the drying effects of the atmosphere. Generally speaking, however, the fresher the eggs when set the stronger will be the chicks hatched. Artificial hatching is preferred to natural methods as there is less risk of disease owing to the young birds not coming into contact with the old ones until they are reared.

In operating an incubator for the hatching of turkey eggs an even temperature is maintained, but is not allowed to exceed 103 degrees Fah. The bulb of the thermometer is raised slightly higher than for fowl eggs and

the temperature during the first week is maintained at 101 degrees Fah., the second and third weeks at 102 degrees and the fourth week at 103 degrees. The eggs are placed in the machine with the large ends slightly raised, then not touched for two days, after which they are turned twice daily and cooled once a day, allowing one minute cooling for every day the eggs have been in the incubator. After the first week moisture is supplied, a sand tray being used for the purpose, and the eggs are splashed with warm water just before they begin to chip. As in the case of fowl eggs the incubator is not opened after the eggs commence to chip. By adopting this practice turkey eggs are hatched as successfully as hen eggs.

Showing how the Nesting Places are Constructed at Hawkesbury Agricultural College.

When natural methods of hatching are adopted care is exercised to see that both the hen and nest are free from vermin. To ensure this the hen and nest are thoroughly dusted at the commencement of operations with equal parts of tobacco dust and flowers of sulphur. A dust bath is also provided so that the hens can dust themselves during the period of sitting. It is necessary to see that the hen comes off the nest regularly for feed and water, but they should not be interfered with any more than is absolutely necessary, especially at hatching time, otherwise crushed chicks may result.

The eggs are tested for fertility on the seventh or eighth day. This also applies to those hatched by incubator. The testing is done by holding the egg over a hole in a box in which a strong light is placed. Another method of testing is to hold the egg in the bright sunlight at the small end of a cone made of cardboard or leather, looking through the large end of the cone against the sunlight, or other strong artificial light. The fertile eggs are distinguished by a network of veins on one side and the infertile ones are quite clear, having the appearance of a new-laid egg.

Rearing.

Rearing the young poults with ordinary hens is preferred to using turkey hens. It is found that the hens will nearly always take to young poults at any age and the poults are similarly inclined with regard to the hens. The poults and hens are often allowed to run on free range and mix together during the day, but at night-time, when being cooped up it is necessary to even up the numbers so that no overcrowding occurs. The young poults are quite content with any mother, and the hens do not appear to differentiate as they would in the case of ordinary chicks. Another advantage found in rearing the turkeys with ordinary hens is that they will always bring the poults home to cover at nightfall, while a turkey hen will usually remain in the bush, rendering the young a prey to foxes and crows.

Feeding.

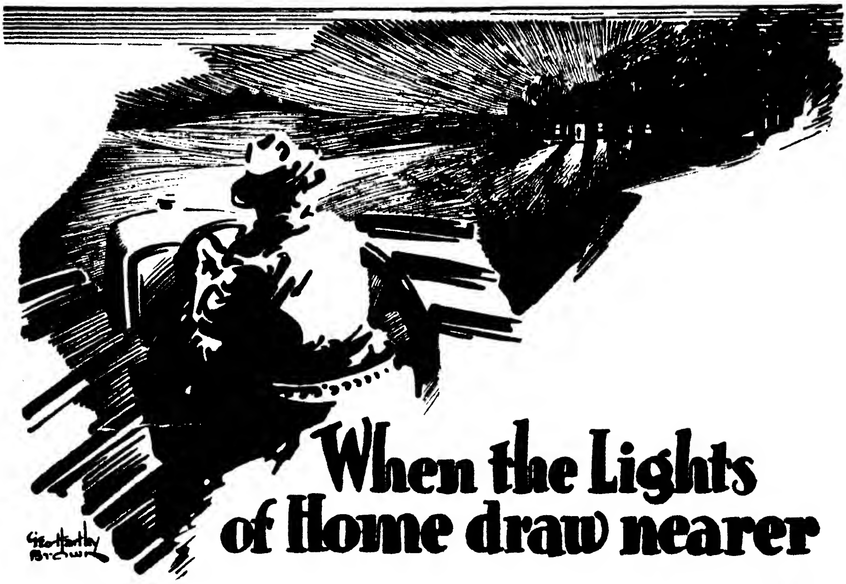
In feeding the young turkeys at the College the same ration is used as for feeding chicks. The poults are allowed to fast for the first forty-eight hours after they are hatched, after which they are fed for two days on dry rolled oats. From this time to six weeks of age three feeds of moist bran and pollard mash mixed with hot skim-milk are given, and a feed of chicken mixture in the evening. From six to twenty-four weeks they receive two feeds of mash, and one feed of cracked maize and wheat. From then onwards a feed of mash is given in the morning and whole maize in the evening. Succulent green feed is given at mid-day, preference being given to chaffed green lucerne. This is given from the time the poults are a few days old, but where grazing is available the green feed is not necessary. After the birds are six months old they are sometimes fed on whole maize in the cob, the cob being cut into three or four sections with an axe, but care is necessary when giving new maize, and it should be fed lightly at first, the quantity being gradually increased as the birds become used to it. Clean water, shell grit, and charcoal are always available to the birds.

Housing.

After the young turkeys have "shot the red" they are allowed to roost in the open or in trees, but before this stage they are protected from the damp, cold weather by housing in well-ventilated houses, fitted with perches at least 3 inches wide and not more than 9 inches from the ground, and the young turkeys are encouraged to perch as early as possible.

Marketing.

Experience at the College has shown that it is useless to attempt to confine turkeys in an effort to fatten them before marketing, because, being accustomed to free range and plenty of exercise, they will mope and lose flesh rapidly if confined for more than a few days. Close confinement leads to the development of digestive troubles, which are responsible for much of the sickness among turkeys. The birds when required for market



are given, in the early morning and at noon, a feed of mash composed of equal parts of bran, pollard, ground oats and maize meal, and a feed of whole maize in the evening.

Caponising has been tried at the College without any material advantage.

The turkeys are marketed in Sydney from June till the end of November, when export requirements are secured. Towards the end of November or early in December private buyers secure their Christmas supplies, but many country breeders who are not familiar with city markets hold their birds until a few days before the holiday season and thus cause a glut, hence the period from June to November is preferred for marketing, the birds at that time being at their best for table use.

Testing Eggs for Fertility.
The testing is done in bright sunlight by means of a hollow cone (made of leather in this instance).

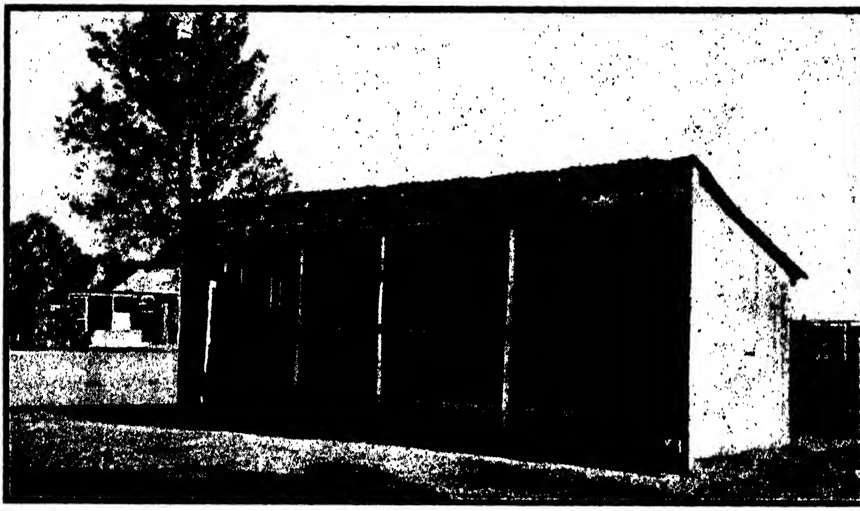
Government poultry crates of the size used for turkeys are obtained for sending the birds to market. Four to five pairs of gobblers or five to six pairs of hens are placed in one coop. Straw or grass is placed in the bottom of the crates for bedding. This is an important point in ensuring that the birds arrive in good condition, as it prevents bruising of the breasts.

Diseases and Parasites.

The three main diseases which have been met with at the College are entero-hepatitis (blackhead), roup, and chicken-pox, and the two parasites commonly found are worms and lice, but, as with poultry, much can be done in the general management to minimise the attacks by such parasites.

Blackhead.—Of the diseases mentioned, blackhead has hitherto been the most serious, and has been responsible for probably two-thirds of the deaths of young birds. Five years ago, mortality at the College among the young poults was upwards of 50 per cent., due solely to the effects of this disease. However, during the last three years, owing to the preventive measures adopted, the trouble has been practically unknown. The disease is found to effect birds of all ages, but more particularly those over a fortnight old, and until they "shoot the red." It is during this period that preventive measures must be taken to be effective.

The methods of treating the birds at the College for the prevention of this disease have proved very effective during the past three years. The measures adopted consist of confining the birds once a week to a house or



A Suitable Colony House for Accommodating Poults until they "Shoot the Red."

yard where no other drinking water is available than that to which ipecacuanha wine has been added at the rate of one dessertspoonful to each quart of water. This quantity is sufficient for about twenty birds one month old. The birds will usually drink it when they come off the perch in the morning. This treatment is carried out from the time the birds are a week old until they "shoot the red." When an adult bird becomes infected, ten drops of ipecacuanha wine are given twice daily while symptoms of the disease are apparent. It has been stated that the ipecacuanha treatment is detrimental to the sight of the birds, but in three years' experience at the College no trouble has been noted in this direction.

Roup.—Very little trouble is experienced at the College with roup among the turkeys. This is due to the fact that proper attention is given to the housing so as to prevent overcrowding. Any cases found are immediately isolated and treated. The most common form is that which affects the nostrils and eyes, but occasionally there is associated with this a cheesy

substance in the mouth. The first indication of the disease is a discharge from the nostrils, which spreads and causes a swelling around the eyes. Treatment consists of syringing out the nostrils with a strong solution of permanganate of potassium, which is done by placing the point of the syringe in the slit in the roof of the mouth and the nostrils. This is followed by holding the bird's head (submerged to the eyes) in the solution for twenty to thirty seconds. This cleanses the nasal cavities. The treatment is carried out twice daily until the disease has disappeared.

Chicken-pox or Warts.—Chicken-pox affects young turkeys in the same way as it does fowls, and is usually prevalent between January and May. By adopting preventive measures the severity of an attack is greatly minimised. The procedure adopted for the prevention of the disease is the same as recommended for fowls, which is to commence during the first week in January giving flowers of sulphur in the mash at the rate of one ounce of sulphur to every seven pounds of mash every third day for three weeks, and for the next three weeks epsom salts is given at the rate of one ounce to each gallon of drinking water every third day for three weeks. Sulphur is again given during the next three weeks, and epsom salts and sulphur are used alternately for periods of three weeks right through until about May, or until there is no further sign of chicken-pox. Any birds which contract the disease are treated by tending the sores with tincture of iodine or common laundry blue.

Worms.—Round worms are the most common among turkeys, and when any bird is found affected it is treated by giving fifteen drops of a mixture of equal parts of turpentine and salad oil, or where numbers are infested and cannot be treated individually, they are given tobacco dust steeped for two hours in enough boiling water to cover it. The quantity used is one pound of dust for each 100 adult birds. The infusion is mixed with half the usual quantity of mash and given to the birds in the morning, after they have been fasted by not giving the usual evening feed the previous night. Epsom salts is then given in the drinking water at the rate of two ounces to each gallon of drinking water. Slaked lime is then sprinkled lightly over the floor of the house and under the perches where the birds roost. This destroys the worms which are passed after the treatment.

"Agricultural Education in the United States."

The Macmillan Co., New York, has forwarded along a copy of Whitney H. Shepardson's "Agricultural Education in the United States," which the author has chosen to label "an irresponsible" publication—Shepardson knows nothing at all about practical agriculture and very little about education, but was commissioned because it was thought that a layman without professional training and without institutional loyalties might furnish a report containing "something different." The book gives a readable account (really a criticism) of the system of agricultural education adopted in the United States.

Poultry Notes.

November.

E. HADLINGTON, Poultry Expert

By the end of this month the brooder houses should again be empty, and the earliest opportunity should be taken to give the pens a thorough cleaning and disinfecting, so that they will remain fresh until the next season. What usually happens is that when the chickens are removed from the brooders the work of cleaning up is left till "later on," and the job is put off from time to time until the next season comes round. The result is that the brooder pens are not in a sanitary condition when the season commences. It should be realised that proper sanitation in the brooder house is a factor in the successful rearing of chickens. The unhygienic state in which some brooder houses are left until they are required for use again, and then only a hurried cleaning is given, does not give the chickens a fair chance at the start.

Brooder Sanitation.

The procedure at the end of each brooding season should be to clean up the pens both inside and outside, special care being taken, if the outside runs have become coated with excrement, to scrape off the surface. A sprinkling of slaked lime can then be applied, and after a week or so the runs should be swept over again.

In cases where any serious disease, such as coccidiosis, has been present, it is a wise plan to dig out 4 or 5 inches of the soil in the runs, lime them over, and allow them to remain so for three or four months, after which they should be filled in again with fresh soil, ramming it down so that it will set hard before the next chicken season.

Reverting to the question of treating the inside of the brooder houses, the cleaning work should be followed by spraying with a strong disinfectant applied hot, and then scrubbing the brooders and floors to make them perfectly clean. A further spraying with disinfectant is desirable prior to the next season, followed by flushing the floors with clean water about a week before the brooders are required. This may seem a lot of work, but that should not stand in the way of having the brooder pens in a fresh and hygienic condition at the beginning of each season.

It should be borne in mind that the greater the number of chickens run through the brooders the more necessity there is for proper sanitation, because numerous bacteria which are harmful to chickens may be present at the end of the season, and if not destroyed are likely to cause infection among the next season's chickens.

Casual Mortality Among Hens.

Throughout the year a number of deaths from various causes occur among the hens, more especially during the flush laying period, or at the end of the moulting season. A large percentage of the deaths are due either directly

or indirectly to ovarian disorders, and with the constant striving for high egg production it is only to be expected that such troubles will increase. The feeding of highly concentrated and stimulating foods tends to accentuate these disorders, probably to a greater extent among the pullets than among the hens.

Perhaps one of the commonest complaints met with among the layers is prolapse or protrusion of the oviduct, which is characterised by the mucous membrane of the oviduct protruding through the cloaca. Such cases may be due to a variety of causes, such, for instance, as straining when laying large eggs, lack of stamina causing weakness of the organs, over-stimulation, or disease, &c. Some of these cases if taken in time can be cured, but, if neglected, inflammation and infection will usually occur as the result of exposure and picking by other birds, or, as happens in many instances, the affected birds are quickly killed by the others, all of which have cannibalistic tendencies.

Affected birds should first be removed from the pen and placed in a coop. The parts should then be washed with an antiseptic solution, which should be followed by lightly dusting with powdered alum; then replace the protruding part of the oviduct. The bird should be given a change of food, and should be fed sparingly for a few days with the object of stopping laying. If laying continues there is little chance of recovery, as the straining causes a recurrence of the trouble.

A trouble similar to protrusion of the oviduct is sometimes caused by the birds picking at the cloaca after a hen has laid, or the same thing may occur where the perches are placed too close together. This is usually the result of a craving caused by some deficiency, such as lack of suitable shell grit, insufficient salt, want of greenstuff, or too close confinement without scratching litter being provided to give adequate exercise. The damage may not extend beyond injury to the parts, but instances have been observed where cannibalism has occurred and the internal organs have been pulled out.

Eggs in the Abdomen.

Another trouble which is responsible for a percentage of deaths is caused by the yolks of eggs dropping into the abdomen outside the oviduct. This may be due to disease or weakness of the ovary or oviduct, over-stimulation, &c. What happens is that the yolk when detached from the ovary, instead of falling into the infundibulum, or funnel-shaped opening of the oviduct, drops into the abdominal cavity. Thus a mass of yolks may remain in the abdomen, and in some cases becomes dried owing to the liquid being absorbed, whilst in other instances the yolks may remain soft, and in either case infection eventually occurs, resulting in peritonitis.

Sometimes eggs with the shell on are also found in the abdomen as well as yolks. This is the result of a rupture of the oviduct, due sometimes to some obstruction in that organ or to disease weakening the walls of the oviduct, so that rupture occurs. Peritonitis, or inflammation of the abdominal cavity, results, and death occurs in a short time. The outward symptom in these cases is a distension of the abdomen, which either becomes hard or is filled

with fluid. In bad cases the bird will be observed to stand in an upright position with the abdomen dragging on the ground as if her back had been hurt. It is useless to attempt treatment, because even if a cure were effected the bird would be incapable of again producing eggs.

Eggs Broken Inside the Bird.

It sometimes occurs that eggs with shells on are broken in the oviduct or in the abdomen, caused by an injury to the bird, perhaps by being crushed. Where the eggs are broken in the oviduct obstruction is caused and death soon follows. Broken eggs outside the oviduct may occur where eggs have escaped into the abdomen from a ruptured oviduct and the bird has received a knock or been crushed, causing breakage of the eggs.

Cysts or Tumors.

Occasionally birds which have been laying are noticed to cease producing entirely, and while in some instances they continue apparently in good health, others gradually sicken and die. Post-mortem examination in some of these cases shows the ovary to be affected by cysts, which may be filled with a colourless fluid or partly dried yolk material. The cysts are usually irregular in shape and size, and may be few or numerous.

It, of course, does not always follow that a hen which ceases to lay is so affected, because there are other conditions which have the same result, such as abdominal tumors, diseased oviduct, &c.

Dropsy.

A fairly common condition found among hens is an enlargement of the abdomen, which is caused by the accumulation of fluid. This is known as abdominal dropsy. The quantity of fluid varies, but cases have come under notice where nearly a pint of straw-coloured liquid has been present. In extreme cases the birds may assume an upright position with the abdomen dragging on the ground, as previously described. This condition is assigned to various causes, among which are chronic cases of enteritis, inflammation of the peritoneum, tuberculosis, or diseases of the liver and kidneys. Seldom is treatment effective, and it is, therefore, best to destroy affected birds. If it is desired to treat a valuable bird, a trocar or similar instrument should be inserted through the wall of the abdomen, allowing the fluid to drain, but care is necessary to avoid penetrating the vital organs.

From time to time inquiries are received concerning deaths from the various symptoms described, and it is with a view to explaining some of the probable causes of mortality that these matters are dealt with.

Red Mite Infestation.

With the approach of summer a constant watch is necessary to see that mites are not becoming numerous in the poultry houses. Where heavy breeds are kept the nests are a common source of infestation, and even though the perches are kept oiled the houses may become swarming with the parasites, and when this occurs the health of the birds is seriously affected.

Spraying the houses both inside and outside, including the roofs and floors, several times at intervals of a day or two with kerosene emulsion is about the most effective and cheapest method of eradicating the pest. The emulsion is made by dissolving ½ lb. of soft soap in 1 gallon of boiling water, and then adding slowly a gallon of kerosene, stirring briskly all the time and for a few minutes afterwards. This stock solution is then added to 9 gallons of soft water, preferably warmed. The mixture should be stirred occasionally while using.

The Angora Rabbit Wool Industry in England.

In a review of the angora rabbit wool industry in England in the September issue of the *Journal of the Ministry of Agriculture*, the number of angora rabbits in England at the present time is given as upwards of 120,000 distributed among some thousands of breeders, and the amount of capital invested as £200,000 on the breeding and production side and £120,000 in the spinning and manufacture of the wool. The price paid for fine grade angora wool, it is stated, has remained steadily around 34s. per lb. for the last two or three years.

The industry made enormous expansion from the conclusion of the war up to 1926-27, for which year the estimated value of the clip was about £30,000. In April, 1928, it was found that the market for the English angora wool clip was becoming restricted, and among the possible reasons cited are—

(*a*) Large importations of foreign, chiefly French, angora wool;
(*b*) substitution of other material for angora wool in yarn and fabrics, with a consequent undermining of public confidence in angora; and
(*c*) changes of fashion rendering lines of which angora is a principal constituent, unsaleable.

Importations are considerable, and official returns show that in the period January to March, 1929, 23,600 lb. were imported. It is probable, the report states, that large quantities of French angora wool, which is said to be of coarser texture, may be used in the spinning and weaving in order to give additional body to the yarn. French wool is imported at prices much lower than those paid for English wool, and the average value of the French imports for the three months ended March, 1929, was declared to the customs authorities as 14s. per lb.

Angora fabrics and articles into which angora wool is introduced are, according to the review, likely to be regarded as a luxury trade for some time to come. The market may, therefore, remain a somewhat special and restricted one, susceptible to the changes of fashion.

At the time of writing of the review (May, 1929) some of the chief English buyers were still restricting their purchases to comparatively small quantities from their old customers. Numbers of small rabbit keepers were consequently in considerable difficulties and unless an outlet for the wool can be found in the near future, the number of angora rabbits kept must soon show a serious decline.

Orchard Notes.

NOVEMBER.

C. G. SAVAGE and H. BROADFOOT.

An Adverse Season and its Lesson.

MR. S. A. THORNELL, Orchard Inspector, Young, writes that the past season's drought has been responsible for a remarkable change of mind on the part of a number of orchardists (particularly cherry growers) in his district. Many who keenly advocated planting on Mazzard stocks in order to obtain large trees are now just as keenly advocating the use of the smaller-growing Kentish stock.

The change has been brought about as follows:—Many varieties of cherries on Mazzard stocks died right out last season, hundreds more are at present in a bad way, while, in addition, it has been found necessary to remove thousands of dead limbs. The varieties which suffered most were Early Purple Guigne, Werders, Early Rivers, Eagle's Seedling, and Florence. In two orchards in the Young district several rows of Florence on Mazzard stocks have died out completely, while an adjacent row of St. Margaret's on Kentish stocks is quite all right.

It has puzzled many how the Kentish, which is a shallow-rooted stock, can stand up to the dry weather conditions better than the well-rooted Mazzard. This season's observations point to the following being the explanation:—The Kentish are surface rooters, and therefore benefit by light summer rains, while the deeper-rooted Mazzard receives no benefits from such falls; as a matter of fact, if the rainfall is very limited the Mazzard perishes. This is what happened last season.

At present the subsoil in the Young district is "bone dry," the recent rains only penetrating from 10 to 15 inches. Should these conditions continue, very heavy losses will result to cherry trees on Mazzard stocks next season.

Apricot Drying.

The attention of growers is directed to the findings of the Commonwealth-wide committee convened by the Council for Scientific and Industrial Research to report on, among other things, the sulphuring of apricots.

These recommendations, which are available in leaflet form, give details as to the proper stage for picking and sulphuring, the type of chamber most suitable, quantity of sulphur to use, period of exposure, &c. The filling of the cups with juice, the leaflet states, is not necessarily a reliable indication of satisfactory sulphuring, as fruit in this condition may frequently be over-sulphured. Correctly sulphured fruit is usually characterised by a firm core, an easily detachable skin, with some exudation of juice into the cup, and a general evenness of colour of the cut surface. The fruit is usually over-sulphured if the whole of the flesh has become softened, and if the cups have overflowed with juice.

Growers can be confident that if they follow the instructions set out in this leaflet they will experience little difficulty in keeping the sulphur content below 14 grains per lb., which is the maximum specified by the English authorities in regard to importations into that country.

Write to the Department for a copy of the leaflet.

Fruit Flies.

The methods recommended by the Department for dealing with this pest are (1) destruction of all infested fruit (an obviously useful method if carried out systematically), (2) spraying the foliage with a poison spray, and (3) trapping the flies by means of traps containing attractive lures.

In connection with the first method, orchardists are reminded of their obligations under the Plant Diseases Act, which enforces the destruction of all infested fruit either by burning, boiling, or burying. One of the most efficient means of disposing of waste fruit is by the use of an insect-proof pit, plans and specifications of which are given in a free leaflet obtainable from the Department. Particulars concerning the mixing and applying of the foliage poison sprays as well as the composition of the different lures used for baiting the traps are given in another leaflet.

Cherry Tree Slug.

Keep a sharp look-out for this pest, and if it should appear make haste to spray the trees with lead arsenate before it becomes too numerous. Sometimes it will be found that two or three applications of spray are necessary in order to get the pest under control. Should it first appear on the trees a few days before the fruit is ready to pick, as it often does, the spraying, of course, must be delayed until after the fruit is harvested.

Packing Cherries.

Cherry picking will be in full swing this month. Those growers who "row in" the face of the box should take care that the fruit used for this purpose is fairly representative of that underneath. It is not an easy matter to strike the correct average size for the face, and most "facers" will unconsciously pick the larger fruit. To overcome this the face can be "bunched in," by picking up the cherries intended for facing by the stalks and placing them in position in bunches. A bunched facing has quite an attractive appearance, and can be made fairly to represent the fruit underneath without any great effort.

Keep Abreast of the Times, or Drop Out.

Science cannot cure all ills of agriculture or of modern civilisation, particularly those arising out of its very success in increasing production per acre and per man, and in dispensing with the less efficient worker and producer; indeed, as science advances the efficiency line will be drawn higher and higher, and an increasing proportion of people will fall below it, unwanted and unemployable.—Sir John Russell, Director of Rothamsted Experimental Station.

Citrus Bud Selection.

List of Nurserymen Supplied with Buds.

The Co-operative Bud Selection Society Ltd. has supplied the following selected Valencia Late orange buds to nurserymen during the 1929 budding season, trees from which should be available for planting in 1930:—

	Buds.
T. Adamson, Ermington	3,100
T. Eyles, Rydalmere	3,500
F. Ferguson and Son, Hurstville	1,500
R. Hughes, Ermington	1,000
G. McKee, Ermington	3,000
L. P. Rosen and Son, Carlingford (late of Epping)	11,400
Swane Bros., Ermington	500
C. E. Vessey, Eastwood	2,000

—C. G. Savage, Director of Fruit Culture.

Grade Your Fruit.

That the grading of fruit is profitable to the grower is accepted by all who have practised it continuously for some seasons. The value of grading cannot, however, be seen in the returns from a few isolated consignments, nor do the results of a number of trials of equal lots of graded and ungraded fruit indicate the position accurately, because the grower who changes over has to live down his reputation for marketing ungraded supplies. The advantage comes when a reputation for honest grading has been built up, and it may take some time to establish a goodwill of this kind. It should be remembered, in this connection, that the best buyers on the wholesale markets have no time to spare for detailed examination of packages and will only look at consignments which, from past experience of the sender, can be relied on for honest grading and packing. Other buyers will buy ungraded packs, but only after careful examination, and the price offered is generally based on their personal estimate of the amount of good fruit present; in such cases, the estimate is not likely to be generous to the grower and, in practice, it usually happens that the " culls " realise nothing although the grower has paid freight, package, tolls, and other charges on them. In times of glutted markets, ungraded packs sell very cheaply, while unculled fruit may not even sell at all. Looking to the future, it is no exaggeration to say that the high standards of grading adopted by overseas growers who market their fruit here, and the steady increase in the quantity of graded home-grown fruit coming on to the markets, will eventually force ungraded and low-grade fruits out of the main channels of trade.

The above extract is taken from the "Report on the Preparation of Fruit for Market," Economic Series No. 21, Ministry of Agriculture and Fisheries, London.

CONTENTS.

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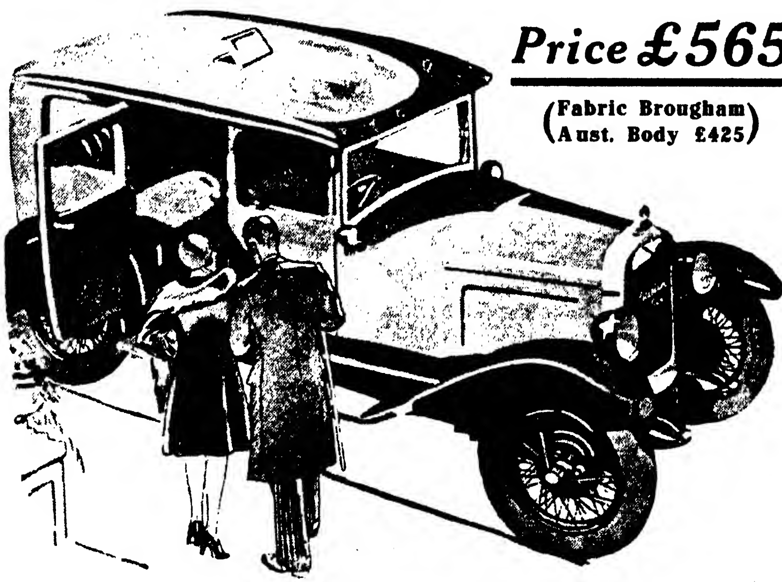

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A. Gaz. 1/12/29

Organised Shipment of Apples to Hull.

EXTENSION OF EXPORT TRADE WITH GREAT BRITAIN.

H. BROADFOOT, Special Fruit Instructor.

IN New South Wales there is such a wide range of soil and climate suitable for apple growing that large quantities are produced of a quality that challenges comparison with apples produced in any other part of the world. And New South Wales is by no means the most important apple-producing State of Australia, being surpassed in that respect by Tasmania, Victoria, South Australia and Western Australia. All these States produce apples of excellent quality.

The total production of apples in Australia is far in excess of local requirements, and for years past Tasmania and Victoria have been exporting their surpluses. For early- and late-maturing varieties a market can usually be found, but it is difficult to dispose of mid-season apples locally, except at a price which does not pay. Growers still retain vivid recollections of the 1928 apple season, when the yield was heavy and great difficulty was experienced in disposing of mid-season varieties at a profit. The approaching apple crop again promises to be very heavy, not only in New South Wales, but in all the other States of the Commonwealth with the exception of Western Australia. In the circumstances, mid-season varieties are likely to be a drug on the market, and as a means of easing the local position, arrangements are being made for a trial shipment of these varieties to Hull during the latter half of March next, when mid-season varieties, such as London Pippin, Dunn's, King David, Jonathan, &c., will be available.

Lessons Learned from Previous Failures.

The idea of exporting New South Wales apples to England is not new, but the results in many cases have been unsatisfactory. In the case of previous shipments the fruit has, as a rule, been packed hurriedly, conveyed to Sydney, loaded on board, and carried as ordinary cargo to Tasmania where the balance of the shipment was picked up. Only then was the refrigerating machinery set in motion, with the result that it took another six or seven days before the temperature in the hold came down to the required degree—amounting in all to over three weeks from the time the fruit was picked in New South Wales. Under such circumstances it is not to be wondered at that many shipments arrived at their destinations in poor condition.

No such risky methods will be adopted in connection with the shipment now proposed. The whole of the fruit will be pre-cooled and the holds filled

to capacity, closed down, and not opened until the vessel reaches Hull. One of the main movers in the project is the Batlow Packing House and Cool Stores Rural Co-operative Society Ltd., which intends to forward between ten and fifteen thousand cases of apples in addition to pears—the pears will be carried in a special chamber. The vessel selected is the "Banffshire," which has already been inspected and found quite satisfactory in every detail for the trial shipment. This boat has a capacity of 35,000 cases, and it is hoped that growers outside the Batlow district will realise the importance of ensuring the success of the venture, which to some extent is dependent on the securing of a full cargo. Although no difficulty is anticipated in this respect, the venture is recommended to every apple-grower in New South Wales as being worthy of the fullest measure of support. It will be the largest cargo of apples that has ever left New South Wales, and it will be the first full cargo ever pre-cooled. This shipment promises to be the forerunner of many other large consignments of apples from this State to England.

Nothing is being left to chance and success seems assured. The undertaking is receiving support from the Department of Agriculture and the Fruitgrowers' Federation of New South Wales, as it is recognised that the knowledge gained will be of incalculable value to the fruit-growing industry. An officer of the Fruit Branch of the Department of Agriculture will accompany the shipment for the purpose of making detailed observations during transit, and reporting on the market prospects on the other side. His report should furnish valuable information on many aspects of the export trade, and throw light upon transport problems about which there is still much doubt.

Hints for Intending Exporters.

Under the headings that follow are given a few hints for the information of growers who anticipate sending along some, at least, of their apples for inclusion in this shipment to Hull.

Sanitation.

Thorough observance of sanitary precautions is at all times essential. Fruit badly marked by fungous disease or attacked by insect pests is quite unsuitable for local or for export trade, especially for the latter.

Picking.

The correct time to pick apples is very important, but after a little experience a grower can judge to a nicety when he should commence the operation. To some extent the colour of the seeds and the colour of the variety are guides, but they are not infallible. The safest guide is the ground colour of the fruit which, green before the apples begin to mature, gradually become slightly yellowish as maturity advances. Until this change

has taken place the apples are not in the best condition for export. Over-ripeness is a more serious defect than immaturity in apples intended for export.

Fruit should not be picked whilst wet and it is desirable not to pick during heat, but if picking during heat is unavoidable the cases should be placed in the shade of the tree as soon as filled and carted to the shed without delay when a load is ready. There the cases should be stacked over-night to allow the fruit to cool, the stacking being done so as to allow for free circulation of air between the tiers. This will expedite the cooling process.

The best results will be obtained by several pickings according to the size of the crop and the variety. All apples do not mature simultaneously and uniformity of size and quality is more nearly obtained by several pickings than by one. Several pickings will also facilitate grading and packing.

Pickers should be careful to avoid pulling away the fruit stalk. The fruit should, as it is picked, be placed carefully into picking bags, and then emptied carefuly into boxes which should be quite free from grit, splinters or protruding nails, as these are liable to puncture the skin of the fruit and allow common rot organisms to enter. Growers must recognise that the keeping quality of an apple depends more upon the skin being kept intact than upon any other single factor. Rot organisms not only result in the more or less rapid decomposition of the fruit that has been damaged, but the trouble spreads from one fruit to another. The necessity of avoiding injury to fruit is frequently not realised by growers whose fruit is picked, packed and sold within a few days, but is well known to growers who place their fruit in common, or cold, storage. Care should be exercised in carting so as to minimise jolting over rough roads.

Colour is very important in such varieties as King David, Jonathan, &c., and it is highly desirable that only well-coloured specimens should be shipped, but they should not be over-matured.

Size.

The size of apples intended for export is very important, as size influences keeping quality. Generally speaking, the best size for export is from $2\frac{1}{4}$ inches to $2\frac{5}{8}$ inches diameter, for such apples keep better than larger ones, and in addition (this is also very important) they colour better and have, other things being equal, a finer flavour, as the forcing that induces size frequently results in poor colour. This rule is, of course, not without its exceptions. Some apples may grow very large and yet colour well and keep well. In addition to the foregoing advantages attaching to apples having diameters of $2\frac{1}{4}$ to $2\frac{5}{8}$ inches is the very important consideration that shop-keepers find the medium-sized apple a better seller than the larger fruit. A case with a good count is a desideratum. The London Pippin, Dunns, King David, and Jonathan should, for shipping purposes, not exceed $2\frac{5}{8}$ inches in diameter, but, on the other hand, 3-inch Granny Smiths will keep and carry well.

Grading for Size and Quality.

The advent of the mechanical fruit grader has made easy the work of grading fruit to size. There are many such machines on the market to suit the large or the small grower, and they certainly do the work more quickly and more accurately than it could be done by hand and eye sizing. Hand sizing is slow, costly, and, generally speaking, unsatisfactory. Machine sizing by comparison is quick, accurate, and cheap. Growers who have not yet purchased a sizing machine should do so as soon as possible. Such a machine is of considerable assistance to packers. By its help they can pack more expeditiously and more satisfactorily, for that good packing depends chiefly upon good sizing needs no demonstration.

Grading for quality is of great importance—it is just as important to separate clean, well coloured fruit from slightly blemished fruit, and slightly blemished fruit from fruit carrying larger blemishes as it is to size the fruit. Matured fruit should not be packed with over-matured fruit. All fruit in the various grades should be as nearly as possible equal in size, appearance, quality, and maturity.

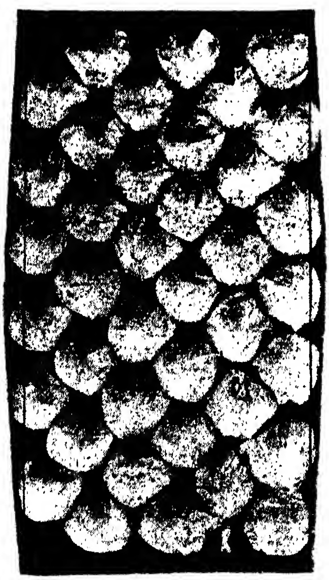


Fig. 1.—Note the bulge in the sides of the case. Damage to the fruit is caused by using cases with flimsy sides.

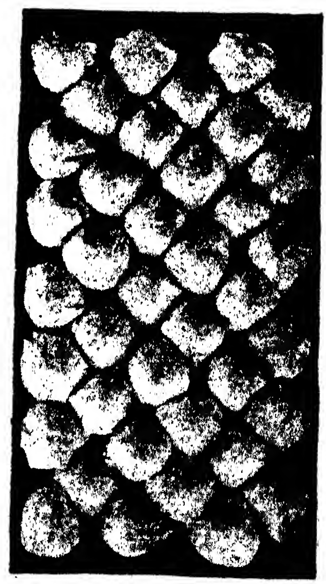


Fig. 2.—A stout side protects your fruit.

Cases.

The types of packing cases most extensively used in New South Wales for apples are the Canadian, Australian, and North-west. The inside measurements of these cases are as follow:—*Canadian*: Length, 20 in.; width, 11½ in.; depth, 10 in. *Australian*: Length, 18 in.; width, 8⅝ in.; depth, 14¼ in. *North-west*: Length, 18 in.; width, 11½ in.; depth, 10½ in.

A well constructed case is essential—it would be hard to estimate the loss of fruit due to faulty case construction. Cases are often made of unseasoned wood, and such cases necessarily suffer from shrinkage of the timber. They are, too, often constructed of very flimsy wood, and the timber used for the sides is often as thin as that used for the tops and bottoms; consequently when the fruit is packed the sides bulge, with resultant damage to the contained fruit when the cases are stacked. Sometimes, again, cases are constructed with too much space between the boards, and the skin of the apples resting on the edges of the separated boards is broken and the fruit laid open to attack by the germs of decay. Decomposition then takes place, and quickly spreads to other apples in the case.

Length and Gauge of Nails.

Many growers who buy timber in shooks and make the cases do not use nails of sufficient length or gauge, and consequently the nails draw out under the slightest pressure, causing a board or side of the case to fall away, and resulting in the spilling and damaging of the contents. After the cases have been wired there is no danger of the boards becoming loose or falling away, but this often happens while the cases are being handled before wiring.

The length and gauge of nail to use will depend on the class of timber which is being used for the making of the cases. For the softwood bushel case $1\frac{1}{2}$-inch 15 gauge should be used for nailing across the grain and $1\frac{3}{4}$-inch 14 gauge for nailing with the grain. For the hardwood bushel case $1\frac{1}{2}$-inch 14 gauge are best for driving across the grain of the wood, and $1\frac{3}{4}$-inch 14 gauge for nailing with the grain, while $1\frac{1}{4}$-inch 15 gauge are also useful.

Lining Paper.

Clean white lining paper enhances the appearance of the case, and in addition it helps to protect the fruit. When the lid is brought down to its place for nailing, the bottom as well as the lid should spring, so that, to some extent, the whole body of the fruit moves, and that which is in contact with the sides must necessarily be rubbed against them in the process. The fruit certainly suffers less by friction against the smooth paper lining than it would against the unprotected wooden sides.

The Use and Misuse of Wood Wool.

It is obvious that if a little wood wool is placed in the bottom of the case before packing, and some is placed over the top of the fruit before nailing down, the fruit has a soft pad instead of the hard top and bottom with which to come in contact. The use of wood wool in such a manner is quite legitimate, and when the case is nailed down the wood wool (or other packing) will not be within the top or bottom line of the case except just where it projects into the spaces between the fruit. On no account should

wood wool or other packing be used as a padding to take up space in the case or to keep a pack high, for then it is taking space that should be filled with fruit, and true measure is not being given.

Packers.

Special packers are often engaged in very large orchards. They should, of course, be thoroughly competent and should carry out their work conscientiously, but the orchardist must exercise the most careful supervision, and since one or two careless men may involve him in serious loss, such packers should be got rid of. Unsatisfactory packing sometimes results from too great speed, and this is at times a consequence of piecework and of rivalry. Some packers are naturally quick and neat, and others not so skilful try to equal them in their tally with detriment to the grower's interests. It needs no argument to show that it is better for the grower to have his fruit packed well at a reasonably moderate rate than to have it packed very speedily—and carelessly.

The production of apples is a costly, arduous, and uncertain business. There are many factors entirely beyond the grower's control, but when good fruit is produced it must be the orchardist's care to see that the profits from it are not reduced by slovenliness in packing.

Packers should always keep their finger nails short, otherwise damage will be done to the fruit by puncturing of its skin.

Packing.

It is very important that packing should be well done. As this subject is fully dealt with in a leaflet issued by the Department of Agriculture and obtainable on application to the Under-Secretary, there is no need to enlarge upon it here, apart from emphasising the following important points. Wrap each apple carefully, place it firmly in position, and finish the pack so that when the lid is nailed down there will be a slight bulge. If the pack is finished slackly it will not, on account of the shrinkage which has taken place, present a good appearance when the case is opened up several weeks later. On the other hand, packing too high is undesirable as in that case nailing down will badly bruise the fruit. Growers should avoid the open-edge pack. Use the closed-edge pack where possible, and a flat pack for second preference.

Wrapping.

All apples for export should be wrapped. The wrapper helps to hold the fruit in its place in the case, lessens bruising, checks evaporation (and therefore checks shrivelling, which is a result of excessive evaporation), and it lessens the decomposition of odd fruit from spreading to other fruit in the same case. Many growers go to the expense of using wraps, but do not get the maximum amount of benefit from them—the wrap is either too small

to cover the fruit completely or it is not finished over the stalk in order that the latter may be prevented from puncturing the apple in contact with it. Granny Smith apples packed for export should be enclosed in oiled wrappers. Following are shown the sizes of paper necessary for different sizes of fruit:—

WRAPPING PAPER.

Size of Fruit. (transverse diameter) inches.	Size of Paper. inches.
$2\frac{1}{4}$	8 × 8
$2\frac{3}{8}$	10 × 8
$2\frac{1}{2}$	10 × 8
$2\frac{5}{8}$	10 × 8
$2\frac{3}{4}$	10 × 10

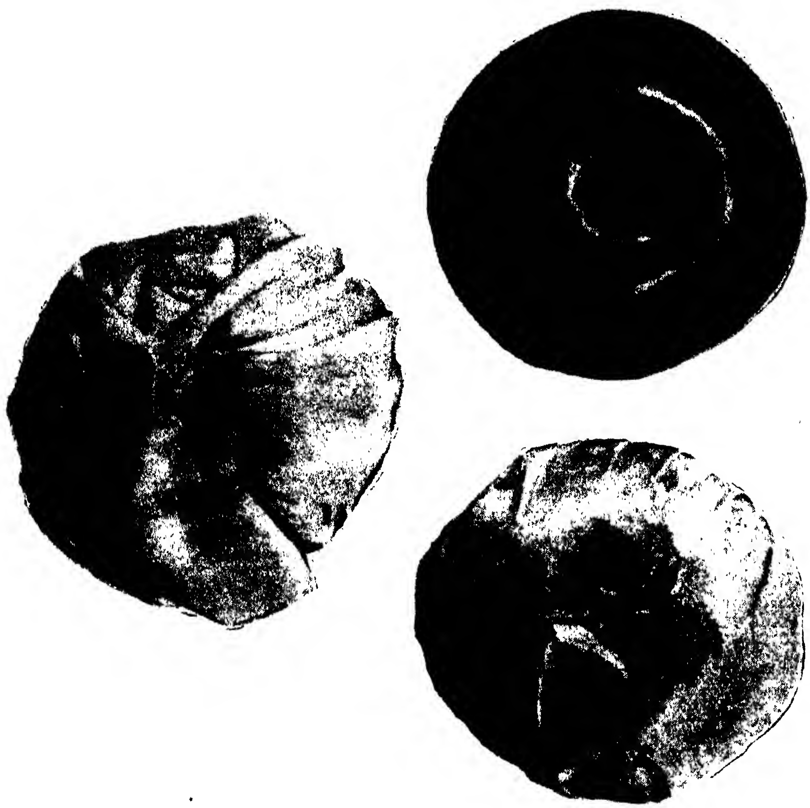


Fig. 3.—Showing, on the left, an apple correctly wrapped. The wrap is finished over the stalk, forming a pad which prevents the stalk protruding through the paper and puncturing the apple next to it. On the right (below) is shown an apple incorrectly wrapped, with the stalk protruding, and (above) the damage caused by it.

Wiring.

The wiring of cases is highly desirable. There are a good many machines on the market which do the wiring quickly and effectively. Two wires are placed round each box about $1\frac{3}{4}$ inches from each end. The wiring adds stability to the box and there is less likelihood of breakages occurring and less danger of the contents being pilfered.

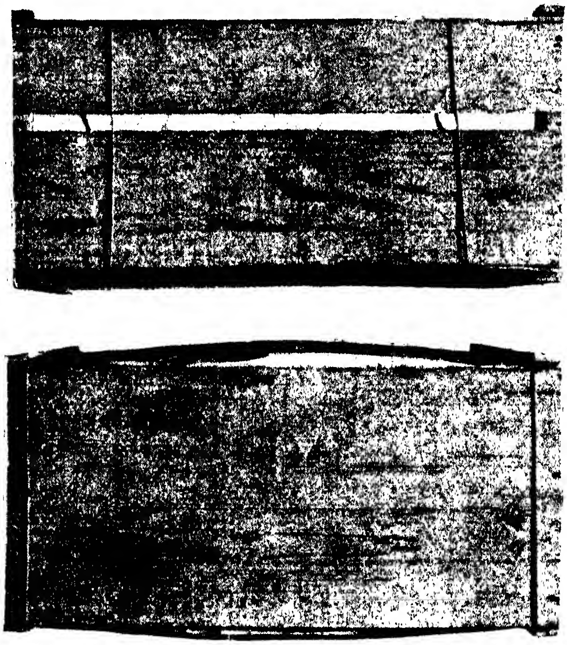


Fig. 4.—Above, case badly wired. The wires are too far from the ends of the box; there is also too much space between the boards on the sides, and there is no bulge on the top and bottom.

Below, a case correctly wired, and showing a bulge on the top and bottom. If a two-piece side is used, the space between the boards should not be more than $\frac{1}{8}$ inch.

Marking of Cases.

To accord with commerce regulations the cases must be branded to show variety, grade, and size or number of apples in the case (the latter is preferred), the grower's name or registered brand, or, in the case of a firm or corporation, the name of such firm or corporation, the address and the word "Australia." A bold and attractive label is a great advantage. It appeals to the eye and stimulates sales. Rough, badly marked cases retard sales.

Advantages of Pre-cooling of Fruit.

The pre-cooling of fruit intended for export to Great Britain or other distant parts is highly desirable. Much greater risk is involved in shipping to distant markets fruit that has not been pre-cooled than that which has.

Take by way of example a co-operative packing shed sending to Great Britain a consignment of 10,000 cases. To pack 10,000 cases for export means that in a normal year approximately 15,000 cases must pass through the grader. Among the fruit will be some blemished and some under and over sized—factors which render it unsuitable for export. In addition, local orders must be dealt with, and as it would tax the resources of any packing shed in New South Wales to pack 1,000 cases per day, it means that packing must commence fully thirteen days before the departure of the vessel. If the fruit is put in the hold without having been pre-cooled, its temperature will not be reduced to the desired degree in the hold of the vessel for six or seven days, making a total of nineteen to twenty days from time of packing to time of satisfactory cooling. When one realises how quickly common moulds spread in a case of fruit not pre-cooled and that a delay of even one day in placing it in storage often reduces the storage life of an apple by four or five days, it will be seen how necessary pre-cooling is.

A grower who decided to forward for shipment 1,000 cases will have to start packing about the same time as a co-operative packing shed. He will have fewer facilities. With pre-cooling facilities at his command a grower can take his time and thus avoid a last-minute rush, which in packing fruit for export frequently leads to losses as a result of haste and consequent carelessness. It is most important that fruit should be sound, and promptly stored and cooled down after picking. It is not difficult to imagine the result if twenty or thirty thousand cases of apples are shipped in a hot condition, especially when a great part of the consignment has been packed for some considerable time prior to loading.

Prevents Loss Due to Over-maturity.

The chief mid-season varieties of apples are London Pippin, Dunn's, and Jonathan. The cold storage life of each of these varieties (when picked at the right degree of maturity and stored promptly) is as follows:—London Pippin nine months, Dunn's nine months, and Jonathan six months, whilst the common storage life is comparatively short. If the fruit packed is kept in cold storage for about three weeks before shipping and is six weeks in cold storage on the boat—nine weeks in all—this represents a small portion of the actual cold storage life of the fruit.

Another advantage of pre-cooling is that it benefits not only the man shipping, say, 500 cases, but also the man shipping 100 cases. If his fruit matures earlier than expected, say, a couple of weeks before the departure of the vessel, it can be picked, packed and placed in cold storage, and there await the vessel's departure. It is of prime importance that fruit should be pulled for storage when it has reached the right stage of maturity. If cold storage is not available the grower is faced with the alternative of sending an over-mature consignment or none at all. Apples do not develop with absolute regularity each year, but cold storage will prevent loss from

over-maturity. Of course, apples may be late in maturing. The grower, if wise and methodical, will have kept a record of dates of maturity over a period of years. Space can then be booked on a vessel sailing about the latest time the variety he wishes to export has matured.

It will be seen from the foregoing that there are many advantages to be derived from pre-cooling fruit intended for shipment overseas. Pre-cooling, however, is only advisable when the total space, whether it be the entire hold or only a special chamber on the vessel, is filled to capacity, it being inadvisable to mix pre-cooled fruit with that which has not been pre-cooled. A little co-operative effort on the part of apple-growers will ensure the filling of the lower hold of the "Banffshire," which can then be sealed and not opened until Hull is reached.

Pre-cooling Facilities.

In the Batlow and Orange districts cold storage is available and fruit from those centres could be pre-cooled locally by placing it in storage as soon as packed. Fruit sent from districts not provided with cold storage facilities could be pre-cooled in Sydney where there is ample accommodation. The temperature of fruit pre-cooled in a country cool store will rise during conveyance to Sydney, but the increase will be so slight that it will be negligible, and it will in no way injuriously affect the fruit. Arrangements could, no doubt, be made with the Railway Department for the haulage of fruit to Sydney during the night-time.

It is fully realised that the additional handling of the fruit and the storage will mean increased cost, but this increased cost will ensure the arrival of the fruit in better condition, and any expenditure is justified which lessens the risk and increases the return.

"Agricultural Entomology."

We are in full agreement with the authors (D. H. Robinson and S. G. Jary) of "Agricultural Entomology," who claim that it is impossible to devise or even appreciate measures for the prevention or counteraction of insect pests unless the essentials of the life-history and habits of the pests concerned are understood.

To supply that information is the aim of their recently published book, a copy of which has reached us from the publishers (Duckworth, London) per favour of Messrs. Angus and Robertson Ltd., Sydney.

In make-up, the work comprises two parts—the first dealing with the elements of entomology, and the second with descriptions, life-histories, damage done by, natural enemies, and control measures for individual insect pests. The book is copiously illustrated, and should prove a useful reference work, although the value of the second half of the book, as far as the Australian reader is concerned, is somewhat limited.

Tomato Prices.

J. DOUGLASS, H.D.A., H.D.D., Agricultural Instructor.

THE economic aspect of tomato production has been given very little attention by growers and others interested in the tomato-growing industry in New South Wales. Most farmers only treat tomato-growing as a side-line, hence financial failure or success only partially affects the total income. Great difficulty will be experienced in compiling reliable data pertaining to the tomato crop until such a time as a greater number of growers depend on tomatoes for their main source of income.

The side of the industry most discussed by growers is the price obtained for the produce. Little account is taken of working costs, and in most cases a balance sheet is never drawn up. The cost of production is most difficult to arrive at and scarcely bothered about. This factor varies with the method of raising the crop, and is greatly influenced by seasonal conditions. Total crop failures are frequently met with and partial successes are the rule. It is not intended here to fully discuss the economic side of tomato culture, but a few brief practical hints on certain phases of the work will be given.

On looking over the whole of the tomato-growing districts in the State it will be found that the picking period extends over the entire year. The factors which mainly influence the time of picking in each district are occurrence of frost and adverse weather conditions. These conditions create a more or less definite period of production in fairly well defined districts.

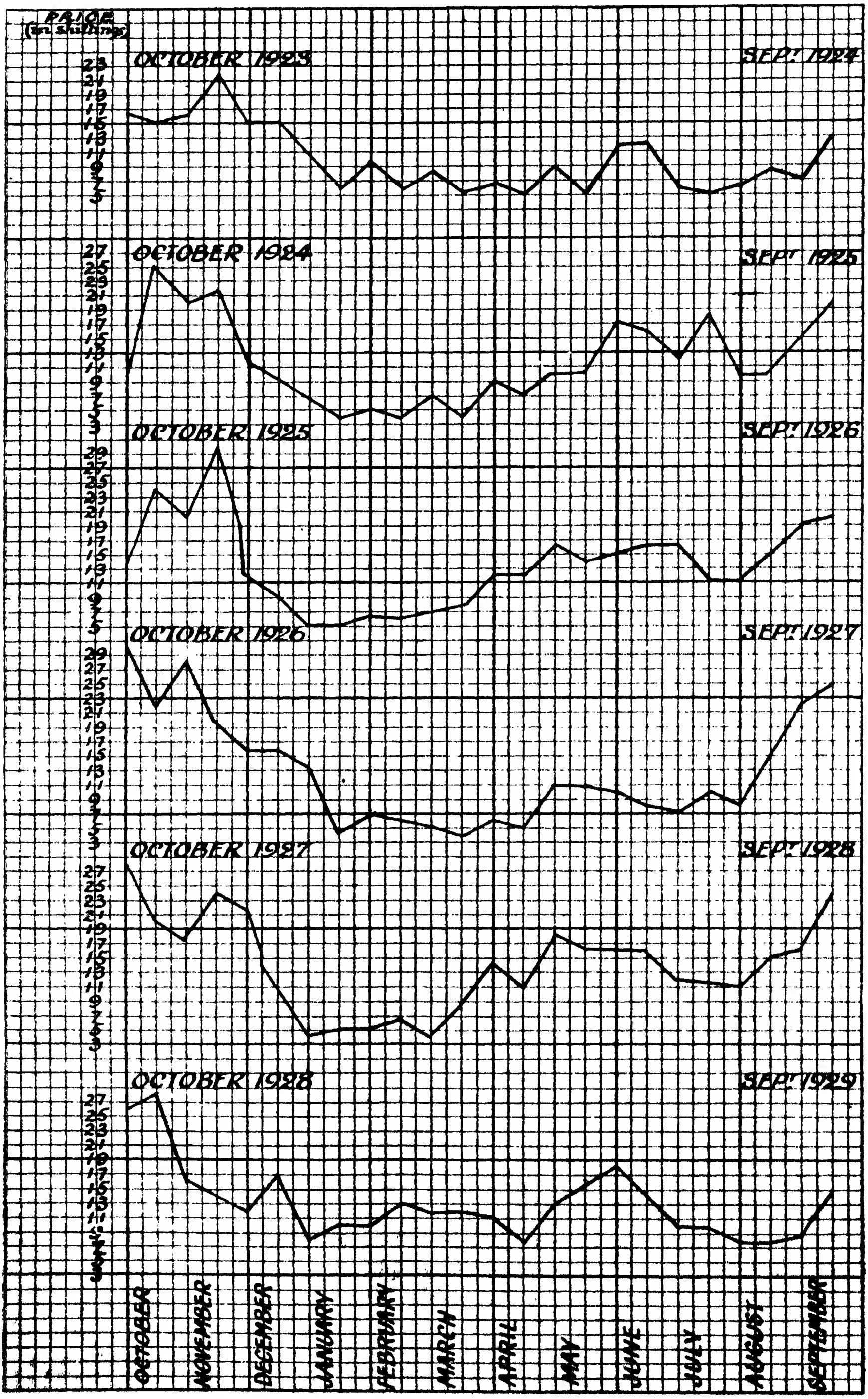
Peak Prices in the Spring.

Peak prices for tomatoes always occur during the spring months and it is the aim of many growers in all districts to pick fruit at this period. It does not always follow that the highest priced tomatoes are the most profitable. It is found in many cases that farmers aim to produce fruit when high prices are ruling, but owing to lack of knowledge, climatic limitations, &c., actually produce the bulk of the fruit during January, when glut and non-paying prices are realised. If growers could only be brought to realise the climatic limitations, &c., of their districts, and alter the cultural methods, choice of varieties, &c., to suit those conditions, more profitable crops would result.

Prices, 1923 to 1929.

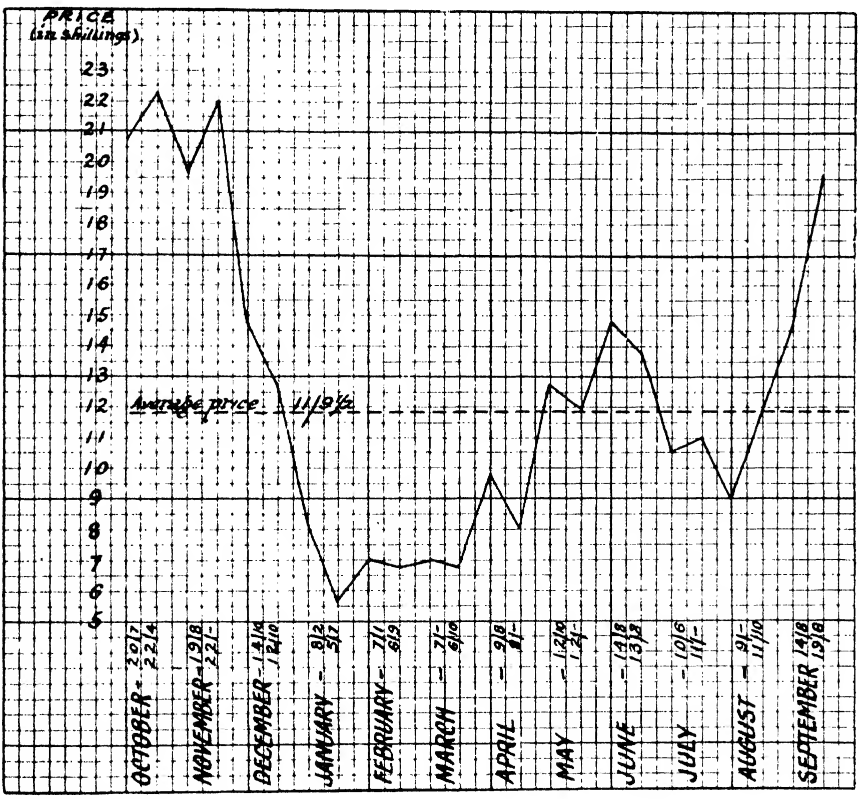
The graphs accompanying this article give the price twice monthly of first-quality tomatoes on the Sydney market over a period of six years, and also the average price obtained during each month over a six-year period.

GRAPH Showing Prices of First-quality Tomatoes.



It is most difficult to ascertain the true market value of tomatoes owing to the wide variation in quality, combined with the absence of grades, &c. In Victoria it is compulsory to grade tomatoes, hence reliable information is available. Experienced growers who practise correct grading, packing, and pay attention to details in marketing always obtain higher prices than those quoted in the graphs. Prices obtained in country districts are not always the same as city prices, but it can be taken that city prices are the basis on which the majority of tomatoes are sold.

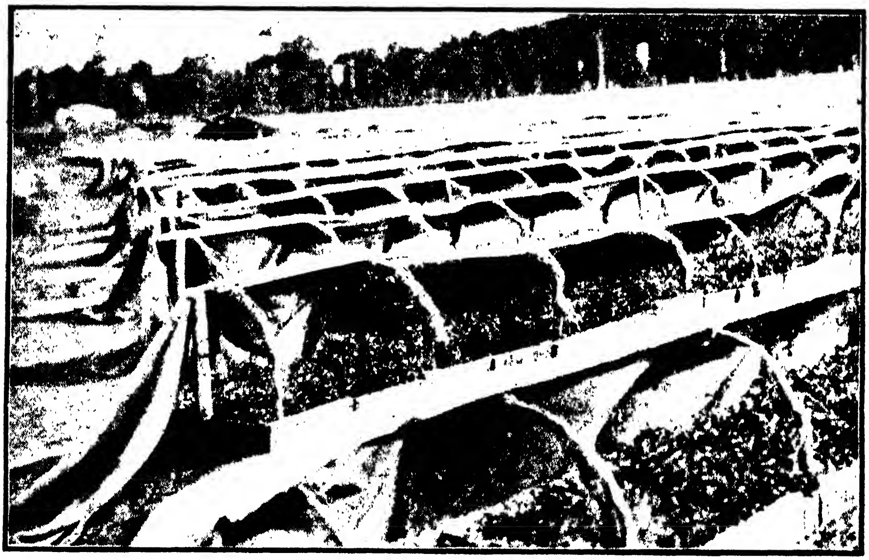
GRAPH Showing Average Prices Over Six Years, 1923–29.



The average price obtained on the city markets over six years was 11s. 9½d. per half-bushel case. This figure appears to be very high, but when it is remembered that this is a gross price and for first-grade fruit only, it will be found that the average for all grades will be considerably lower. The price of first-quality tomatoes is used in this article only as a means of comparison, and is by far the most reliable figure available. Although gluts occurred, first-quality tomatoes were always saleable over the whole period. A comparison of the graphs for different years plainly shows the uniformity of the market at the same period each year. The

peak prices always occur about the same month each year, and the same can be said about the gluts and low prices. Medium prices above and below the average line vary considerably, being influenced by factors which will be discussed later.

Tomato growers who practise expensive and intense methods of culture, such as staking and pruning crops, and glass-house culture, should aim to place their fruit on the market from mid-August to Christmas. It is during this period that there is the keenest demand for high-quality fruit, owing to scanty supply of quality tomatoes during the early warm weather. Earlier in the year, during July and early August, prices are relatively



"Covered," or Chinese, Method of Raising Tomatoes.

Choice of varieties and cultural practices enable the major portion of the crop raised by this method to be picked over a very short period.

low owing to the quantity of inferior quality Queensland and other imported tomatoes on the market and the low consumption during the cold weather. Glass-house growers are in a position to ripen tomatoes at any period from June to Christmas, but, owing to a general impression that there is a "bare" market from mid-June to September, there is a tendency to produce fruit too early. Growers should bear in mind that, whether there is quality fruit on the market or not during that period, prices will be low owing to the quantity of imported tomatoes available and the poor demand during winter months.

The sudden fall in prices experienced late in October or early in November each year when high prices are ruling is due to the marketing of heavy supplies of tomatoes produced by the outside "covered" or the "Chinese" method. The poor quality of the first fruit from the outside "staked" method is also a factor in reducing the price. Payable prices are

usually obtained for early tomatoes until Christmas, when the heavy supplies begin to come forward from second-early districts and from growers practising lax methods with early crops.

The lowest prices during the year are experienced during January, February, and March, and it is at this time that condiment people obtain their supplies. Growers producing during this period should aim at low cost of production, by working large areas economically, growing very heavy yielding varieties, and other methods.

Early frosts during April cut off supplies from late districts such as Bathurst, resulting in increased prices all round. The occurrence of late blight in coastal districts also has the same effect. The late crop harvested during May and June is usually the most risky. The occurrence of frost, floods, hail, diseases, and plagues of insects are agencies which may not only totally destroy individual crops, but crops throughout whole districts. Occurrences such as these often cut off the main source of a market's supply, resulting in increased prices.

Weather conditions during May and June are conducive to a fairly heavy consumption of tomatoes, and as high quality produce is still available, although in diminishing quantities, the result is that prices are always firm during this period.

Canada's Apple Crop.

According to the Canadian Department of Agriculture, the commercial apple crop of Canada is estimated at 3,609,417 barrels, an increase of 273,447 barrels or about 11 per cent. over 1928, and 21 per cent. above the five-year average crop of 2,985,310 barrels.

Most other fruits, including peaches, pears, apricots and grapes, promise equal or better yields than last year.

"The Australian Gardener."

The fact that "The Australian Gardener" (by Leslie H. Brunning) has reached its twenty-first edition is a recommendation in itself. This book has been on the market for over fifty years and is consequently no stranger to the gardener.

Of the 538 pages of text in this new edition no less than 335 are devoted to flower gardening, with shorter sections on vegetables and fruit. However, it is to the floriculturist that the book will chiefly appeal, more so in view of the fact that there is not a plethora of Australian books on the subject. That section is very complete, and deals with general gardening operations (budding, layering, pruning, &c.), garden lawns and playing greens, ferneries, potting and pot plants, as well as treating with the different flowers individually. The book is well illustrated.

Our copy from Messrs. Robertson & Mullens, Ltd., Melbourne.

A Preliminary Classification of Pumpkins and Squashes.

W. H. DARRAGH, B.Sc.Agr., Assistant Plant Breeder.

MUCH confusion exists among seedsmen and farmers as to the classification of the cucurbits which are grown as farm crops or vegetables. These are popularly called pumpkins, marrows and squashes, and belong to three main botanical species, viz., *Curcurbita maxima*, *C. pepo* and *C. moschata*. There is also much conjecture among farmers as to how these species or types will cross.

It is distinctly unfortunate that in the United States of America all the cultivated varieties belonging to the species *maxima* are called squashes, whereas here the best known and most widely grown varieties of this species are called pumpkins. Further, most of the cultivated varieties of the other two species are called pumpkins in America and squashes or marrows in this country. This complicates the position very much, and renders difficult any attempt to identify a common term with any botanical species.

The term "pumpkin" is derived from the Greek pepon, and referred originally to any ripe fruit, and later to any large fruit. The word "squash" is derived from the American Indians, and originally applied only to cucurbits used in an immature condition as summer vegetables, and later indefinitely to all edible varieties. "Vegetable marrow" is the English equivalent for squash.

An attempt is being made in America to limit the term squash to the species *maxima*, and the term pumpkin to the other two species, but some difficulty will apparently be experienced in altering the already popular term squash applied to the bush squashes or scallops. We would have similar difficulty in getting people to call the well-known Hubbard squash a pumpkin. Again, it seems impossible for us to fall into line with America, since our well-known pumpkins, such as Triangle, Crown and Ironbark, are by far the most extensively grown commercial varieties of cucurbits, whereas they are not widely cultivated in America, and what we mostly call squashes and marrows here are widely grown for the market as pumpkins in that country.

Plants of more than one species are thus called pumpkins and squashes, and it is only by separating these into groups that a useful classification of the varieties can be made.

Much useful work in the classification and grouping of cucurbits according to botanical species has been done with American varieties by Werkenthin (1), Russell (2), Castetter and Erwin (3), and Erwin (4). From the practical and the economic standpoints, the classification of varieties into their botanical

species is of importance, since it has been definitely shown by Erwin (4) that the species *maxima* will not cross successfully with either of the other two species. A large number of artificial crosses were made at the Iowa Experiment Station, and the *maxima* x *pepo* crosses set a few fruits, all the seeds of which were infertile. From the *maxima* x *moschata* crosses, a few fertile seeds were secured, but the flowers of the immediate progeny were abortive, many of them producing no stamens. The conclusion is therefore reached that plants of the *maxima* group rarely if ever cross with the other two groups, and that, if crossing does accidentally occur, the result is a mule hybrid, and the farmer or gardener cannot possibly grow a crop from such crosses. On the other hand, the *pepo* and *moschata* species readily crossed, indicating that they are closely related. They seeded abundantly, the seeds were fertile and the hybrid offspring showed good vigour. This supports the theory as to the origin of these species, *viz.*, that *C. maxima* is native to the Old World while *C. pepo* and *C. moschata* are native to America.

Castetter (3) characterises the three species at length and indicates that *maxima* is easily distinguishable from *pepo* and *moschata*, but that these two are difficult to distinguish from one another. Duchesne, who originally described the species *moschata*, found it very difficult to delimit, owing to too little observation with the varieties.

The following is a description, largely by Castetter (3), of the three species—in tabular form for greater help in differentiation :—

	Cucurbita maxima.	*Cucurbita moschata.*	*Cucurbita pepo.*
Seed colour	White or brown to bronze.	Greyish white to ashy grey.	Greyish white.
Margin ...	White seed, identical in colour and texture with body of seed. Brown seed, lighter in colour than body of seed.	Thickened, deeper in colour and of more roughened texture than body of seed; often fibrous.	Identical in colour and texture with body of seed.
Seed scar	Slanting.	Slanting, rounded or horizontal.	Horizontal or rounded.
Plants ...	Strongly running.	Running.	Running or bush.
Stems ...	Cylindrical.	Five-sided, some nearly cylindrical with slight ridges.	Five-sided with distinct ridges and grooves in running varieties.
Stems, leaf stalks and leaf blades.	Rough-hairy rather than spiny.	Usually soft-hairy or rarely rough-hairy.	Spiny.
Leaf blades ...	Somewhat kidney-shaped without distinct sinuses between rounded lobes.	With three to five lobes, not deeply lobed.	Deeply lobed with three to seven distinct lobes
Leaf spots	Absent	Silvery spots at intersections of veins. Few exceptions.	Occasionally occur, but different in appearance from those of *moschata*.

	Cucurbita maxima	*Cucurbita moschata.*	*Cucurbita pepo.*
Flower stalks ...	Cylindrical ...	Five-sided, some nearly cylindrical.	Obtusely five sided.
Unopened bud of flower.	Truncate.	Pointed.	Pointed.
Corolla	Tube nearly cylindrical.	Tube somewhat flaring.	Tube flaring.
	Lobes rounded and reflexed.	Lobes intermediate in shape between the pointed of *pepo* and rounded of *maxima*.	Lobes pointed.
Sepals	Linear.	Long or short, rather flat, with or without leaf-like terminations.	Pointed, short and thick.
Fruit stalk or peduncle.	Cylindrical ...	More or less five sided, with or without grooves.	Five-sided, distinctly grooved.
	Soft at maturity.	Hard at maturity.	Very hard at maturity
Attachment to fruit.	Not enlarged.	Usually enlarged.	Often slightly enlarged.
Fruit shell when fully ripe.	Hard or soft	Mostly hard, sometimes soft.	Very hard.
Blossom end of fruit.	Tends to be drawn out to a point, not recessed.	Recessed.	Recessed.

Cucurbita maxima can be rather readily distinguished from the other two species by—(1) the colour of the seed and the shape of the scar; (2) the practically unlobed leaves; (3) the smooth, cylindrical shape of the soft fruit stalk; (4) the blossom end of the fruit which tends to be protruded rather than recessed. There is difficulty, however, in separating the species *pepo* and *moschata*.

During the last two seasons, a large number of pumpkins, marrows and squashes listed by local seedsmen have been under close observation by the writer at Grafton Experiment Farm with the object of classifying them according to species, and placing them as far as possible into different groups comprising similar varieties, after the manner of Castetter (3). At first the seed was examined closely, and a preliminary attempt made at allocating it according to species after Russell (2). This initial classification was successful with the majority of varieties, but it was found that this character is not sufficient to place the varieties according to species, and that observations on the field characters were also necessary in order to group the varieties.

The varieties under observation have therefore been grouped as follows:

Cucurbita Maxima.

Table or Vegetable Pumpkins.—Hard-skinned varieties, mostly slaty green in colour, weighing up to about 15 lb. These are not nearly as large as the field pumpkins, and are more dense in texture and with only a very small

seed cavity. The flesh is pale yellow to almost orange red. The deeper coloured pumpkins, as a rule, have better texture and cooking qualities than the paler sorts. Varieties under observation were :—Ironbark, Triangle (Triamble), Crown, Queensland Blue.

A good variety of table pumpkin (viz., Improved Sugar) obtained from one seedsman was evidently misnamed, as the sugar pumpkins are of very different type, belonging to the species *pepo*. This variety is of excellent eating quality, and is well worth renaming.

Large Button is a pumpkin of the same size and shape as the pumpkins of the table group, but it is better classed as a cattle pumpkin because of very poor eating quality.

Hubbard Squashes.—Well-known squashes of good quality, such as Improved Hubbard, Green Hubbard, Blue Hubbard, Warted Hubbard, Golden Hubbard, Boston Marrow.

Banana Squashes.—A new type of squash recently introduced from America, having a soft shell and excellent quality :—Banana squash.

Cattle Pumpkins.—Large, hollow, soft-shelled pumpkins weighing from 20 to 40 lb. and over. The colour is generally pink or slaty green, and the shape mostly oblong or round. The seed is large and pure white, but is not very thick. Varieties under observation were :—Mammoth Bronze, Mammoth Chili, Globe Mammoth, Large Button, Mammoth Yellow or Large Yellow, Small Button, Mammoth Whale, Mammoth Cattle, Turk's Cap, Potiron.

Cucurbita Pepo.

Scallops or Bush Squashes.—Small, round and flattened squashes with scalloped edge, mostly white or golden in colour and borne on bushy plants. The yields are very good. The average weight of the fruit is 3 lb. They mature early and are often called summer squash in contrast to the later maturing winter squashes. They should be used as a vegetable before the shell hardens as the flesh soon becomes tough and bitter. Varieties under observation were :—Early White Bush, Mammoth White Bush, Early Golden Bush, Golden Custard and Custard.

Crookneck Squashes.—Bushy plants with very good yields. The fruits are golden or white in colour with long curved necks and are much warted. These also are early maturing and should be used before the shell hardens. Variety observed :—Yellow Crookneck.

Vegetable Marrows.—The vegetable marrow is a popular vegetable, common on the market. The colour is mostly pale golden or golden with broad irregular green stripes. Plants are of bush or running habit. The fruit is long and oblong or somewhat cylindrical in shape and with smooth skin. For use before the shell hardens. Varieties tested were :—Long Green Bush Marrow, Long White Bush Marrow, Rice, Moore's Cream.

Sugar Pumpkins.—Vines of running habit. Fruit round with flattened ends, light brown in colour. Surface grouped and ribbed. Shell very hard at maturity. The fruits have a large seed cavity and are inclined to be hollow. Varieties grown last season were :—Connecticut Field, Small Sugar and Winter Luxury. These three varieties are very much alike in all characters except that of size. The small varieties are most suitable as pie pumpkins, the larger varieties for stock. None of these is suitable as a vegetable.

Fordhook Squashes.—Contains both bush and running types. The fruit is small, but has distinct grooves and ridges, and is more or less elongate in shape. The varieties grown last season did not reach maturity, but it appears that Fordhook Squash, Fordhook Bush Squash, and Delicata Squash belong to this group.

Cucurbita Moschata.

Grammas or Rios (*Cushaws* of America).—Large, curved or pear-shaped fruits, light brown in colour. Most of the fruit is solid and the seed is borne in a cavity at the blossom end. This is the favourite fruit for pies in Australia. Varieties tried were Trombone, Bugle and Pear.

There are definite indications, from a number of varieties that have not been completely classified, that another sub-group of *C. moschata* will be made here.

Summary.

This is not to be regarded as a complete classification, as a number of varieties which are catalogued by local seedsmen have not yet come under observation. Publication is made at this stage to show the progress of the work, which has been called for by seedsmen to clear the question as to how the cucurbits may be classified according to botanical species.

The fact that none of the *maxima* species will effectively cross with the varieties in the other two species is an important practical consideration which may assist farmers in arranging their crops of pumpkins and squashes, when more than one variety is grown. Until further investigations are made, it may be assumed that any variety belonging to the *pepo* species will effectively cross with any variety of the *moschata* species, and that any variety will cross with another of the same species.

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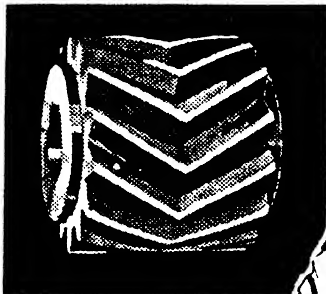
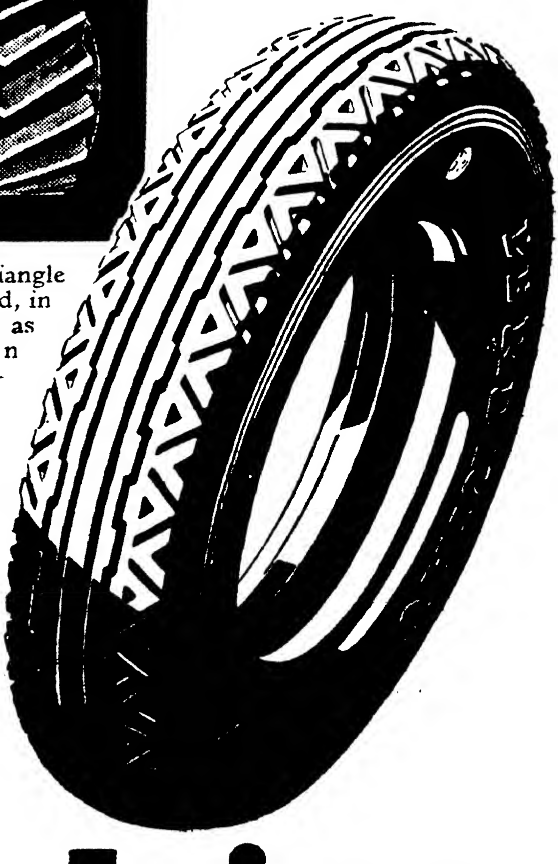




Rock Melons and Casabas.

A Classification of Varieties.

W. POGGENDORFF, B.Sc.Agr., Assistant Plant Breeder.

ROCK MELONS are well suited to the climatic conditions of the Murrumbidgee Irrigation Area, and are becoming more extensively produced for market. It is desirable therefore that growers should have some knowledge of varieties.

The varieties listed by local seedsmen and some introduced varieties have been under observation by the writer during the past two seasons, and a preliminary classification of these has been made on the basis of that designed by the late J. T. Rosa, of the University of California. This classification, together with some brief notes on the varieties, should be helpful alike to seedsmen and growers in New South Wales. More detailed observations on the varieties have been made for descriptive purposes, and for use in locating characters which may be of value in cross-breeding, but these are not presented here.

A few varieties listed by New South Wales seedsmen have not yet been grown, but these will be classified later.

Jenny Lind Group.

The fruit of these melons is generally small, flattened globular in shape, ribbed and netted, with smooth, shallow sutures. A protruding button at the blossom end is fairly common. The quality is good, but the melons are not suited for transport. The varieties in this group may be classified as (*a*) green fleshed—Jenny Lind, Improved Jenny Lind; (*b*) pink or salmon fleshed—Emerald Gem. Descriptions of these varieties follow.

Jenny Lind.—A very old and well-known variety, early maturing, of good quality, and a good yielder. The ribs are well defined, and the melon densely covered with netting, except in the shallow sutures. The skin is greenish-yellow when ripe. The green flesh has a faint salmon lining around the rather large seed cavity. The flesh is fine in texture and fairly firm, and the flavour good and sweet, but delicate. This variety has long been popular as a home garden type; its comparatively small size and unsuitability for transport prevent its becoming popular as a market variety. It is likely to be replaced by the variety next described.

Improved Jenny Lind.—Similar to Jenny Lind, but more nearly globular in shape, and slightly larger. The flesh is thicker than that of Jenny Lind, with a similar but more pronounced flavour and aroma. This variety is a decided improvement on Jenny Lind, and should replace its parent wherever grown.

Emerald Gem.—Also a popular old variety, early maturing, globular, of small to medium size. The flesh is fine textured, thick, highly aromatic, and of very good flavour. This variety does not handle well, and is subject to cracking with rain, but its high quality, attractive appearance, and good yielding powers make it very popular for home growth and special local markets.

Netted Gem (Rocky Ford) Group.

The varieties in this group (Netted Gem and Nutmeg) are early maturing and the fruit is small to medium in size, oval in shape, ribbed and well netted; the flesh is green. They have been practically superseded by others (Pollock group) developed from them and more suited to market purposes, and are no longer of importance except for the home garden.

Netted Gem.—A favourite old variety, fairly early maturing, and a good yielder. The flesh is fine textured, melting, and has excellent flavour and aroma. As a variety it lacks size, and does not handle well, but its high quality merits it a place in the home garden. This variety has given rise to a number of others, but their carrying capacities have been improved at some slight sacrifice of quality.

Nutmeg.—Later maturing than Netted Gem, and the flavour is not as marked; it has a tendency to become insipid and floury in texture if not consumed while the skin retains its green tint. This variety derives its name from its shape, and from its strong spicy odour. It does not appear to be of any great commercial value, and Netted Gem has better quality for home growth.

Pollock Group.

This group has been developed from the Netted Gem (Rocky Ford) group, and includes the principal market varieties. Attention was given particularly to improvement of handling qualities, uniformity of size, high yield and retention of quality. These points, in addition to fairly early maturity, go to make the most desirable type of market melon for commercial growing.

The fruit of varieties in this group is medium in size, rounded-oval in shape, not ribbed, heavily and uniformly netted. The sutures are shallow or absent. The group is divided into salmon fleshed and green fleshed types, with an intermediate green fleshed salmon-lined type, and includes the following varieties:—(*a*) Green fleshed—Delicious, Champion Market; (*b*) green fleshed, salmon lined—Pollock 10-25, Matchless; (*c*) salmon fleshed—Hale's Best, Yellow Cantaloupe.

Delicious.—A mid-season variety of good quality, and a fair yielder. The flesh is fairly thick, medium textured, and has a particularly attractive bright green colour and good flavour.

Champion Market.—Differs from the others in being more globular, but of similar type—fine textured, pale green flesh, melting, of good flavour, and with a distinctive odour and aroma.

Pollock 10-25.—One of the best known and most widely grown varieties in the commercial melon producing districts of United States of America. It has thick, salmon coloured flesh shading to green towards the rind, of good texture and flavour. This variety was developed specially for market purposes—it carries well owing to its heavy and uniform netting, and the uniform medium size facilitates packing for shipment.

Matchless.—This also is a good market variety, with rather coarser-textured flesh, not as melting as that of Pollock 10-25, but with very good flavour and strong odour and aroma. It is a good yielder and attractive in appearance, but is not likely to become as popular as Pollock on account of its coarser texture.

Hales' Best.—One of the most promising varieties tried in its class. Early to mid-season maturing, prolific, and attractive in appearance. The flesh is a deep golden yellow, thick, of medium texture, and fairly melting; it has a good sweet flavour, and marked odour and aroma. Unlike many other varieties, it retains its quality for some considerable time after picking. This variety should become popular for large-scale market growing. Seed was obtained from United States of America, and is not yet stocked by Australian seedsmen.

Yellow Cantaloupe.—A mid-season variety, not as heavily netted as most of the others in this group, and consequently not quite as good a carrier. The flesh is fine textured, and of good flavour and attractive odour. The variety is suited to local markets, or for home growth. Its fine-textured flesh gives it an advantage over Hales' Best, though it is not as good a carrier, and has not as strong a flavour.

Hackensack Group.

This group comprises varieties having large oblate or globular fruits, coarsely netted, with medium-smooth, deep sutures, and early to mid-season in maturity. The fruit is generally too large and delicate-skinned for transport, and lacks quality. The varieties consist of Hackensack, Baltimore, and Long Island Beauty.

Hackensack.—An old and well-known, early-maturing variety with greenish-yellow flesh of medium thickness, lacking marked odour, but fairly fine textured, melting and juicy; the flavour is not pronounced. This variety is subject to severe cracking with rain; it is quite useless for market, and its size appears to be the only feature which keeps it growing in the home garden.

Baltimore.—This variety is of better quality than Hackensack. The flesh is salmon-yellow, of fine texture and good flavour, but becomes mealy and insipid if not consumed when just ripe.

Long Island Beauty.—This proved to be one of the least promising varieties tried—it lacks flavour, being almost insipid, even when freshly picked.

Fordhook Group.

The fruits of this group are medium to large in size, obovate, ribbed, lightly netted; the sutures are smooth and shallow, often irregular, and the skin grey. The flesh is firm in texture and generally of good flavour. The group includes varieties commercially suited to local markets, but not as a whole as prolific as those in the Pollock group. The varieties comprise Irondequoit, Bay View, Fordhook, The Nugget, Large Yellow Cantaloupe.

Irondequoit.—This is one of the best varieties in the group. The flesh is very melting, deep salmon at the seed cavity, shading to yellowish green, and of good flavour.

Bay View.—A very large mid-season variety, but lacking in quality and keeping powers, and very subject to cracking.

Fordhook.—A medium-sized, early to mid-season variety. The flesh is salmon coloured, somewhat coarse in texture, but melting and of good flavour. It is a better yielder than most of the other varieties in the group.

The Nugget.—A large mid-season variety, almost free from netting. The flesh is fine textured, firm, melting, of good odour and flavour when just ripe, but becomes mealy on keeping. A fair yielder.

Large Yellow Cantaloupe.—A large mid-season variety with fine-textured, salmon flesh. It has a strong, attractive odour, but the flavour is not marked and becomes insipid unless the melon is consumed immediately it is ripe.

Osage Group.

The fruits of varieties in this group are large, oval, lightly ribbed, sparsely netted, with green skin and smooth, broad sutures. The majority are mid-season to late maturing. The flesh is salmon-coloured and well flavoured, but inclined to be soft. The group is suited only for the home garden or very local markets. The variety observed was Miller Cream.

Miller Cream.—One of the best flavoured varieties grown last season. The flesh is uniformly salmon-pink, except for a greenish tint near the skin, and very thick, fine textured, fairly firm, and melting. The odour is strong and pleasant. Miller Cream is a high-quality table melon, but will not carry over any great distance.

Hoodoo Group.

The fruits of melons in this group are small to medium, rounded-oval, ribbed, heavily netted, with sutures shallow and partly netted over. The flesh is salmon and shipping quality excellent. The variety observed was Paul Rose.

Paul Rose.—A medium-sized mid-season variety, with salmon flesh of medium texture, firm, melting, of very good flavour and odour. The yield and size compare well with those of varieties in the Pollock group.

Honeydew Group (Casabas).

Although the term "casaba" seems to be popularly regarded as synonymous with the variety Honeydew, that variety is merely one of a number of varieties originating in the Kasabah district of Asia Minor.

This group is of considerable commercial importance. It is distinguished by late maturing, globular or rounded-oval shaped fruits, generally of large size, good keeping and shipping powers, pale green or white flesh, free from ribbing, and of general high quality. Although the stem "slips" sometimes when the melon is ripe, it does so with much greater difficulty than is the case among rock melons proper. The varieties comprise Honeydew, Honey Ball, Golden Beauty, Large Persian.

Honeydew.—A very high-quality melon, and a fit standard of comparison for its class. It is prolific, a very good keeper and carrier, and a deservedly popular market variety. The flesh is white, with a marked green tinge, becoming more pronounced towards the skin, fine textured, melting, sweet; the flavour is excellent, with a characteristic fresh quality; odour and aroma are almost lacking. When ripe the skin is pale creamy white, becoming lemon-yellow on the exposed side. This variety is apt to crack with wet weather, and is very subject to anthracnose. It crosses naturally with even greater readiness than most rock melons, and should be very thoroughly isolated if seed is to be saved.

Honey Ball.—Supposedly a cross between Honeydew and Texas Cannon Ball. It is practically a miniature Honeydew, resembling that variety in all but size. It is 4 to 5 inches in diameter. It should prove suitable for special markets where a small, globular good-keeping melon of high quality is required, as in sundae shops, although the non-coloured flesh may be a disadvantage.

Golden Beauty.—This variety is chiefly notable for the thickness of its flesh, which is white, fine textured, melting, but not very sweet; the flavour is good, but weak. It is a good quality casaba, and would carry and keep well, but is not likely to become popular on account of its wrinkled skin and lack of pronounced flavour. Very subject to anthracnose.

Large Persian.—A high-quality casaba, which should become a popular market variety if its large size is no objection. It is larger than Honeydew, and very lightly netted. The flesh is greenish white, fine textured and melting; flavour is very good, sweet and fresh, not as strong as that of Honeydew, and slightly different; odour is distinct and attractive. This variety is apparently not subject to cracking, and fairly resistant to anthracnose.

Miscellaneous Group.

Banana.—A variety of little commercial importance, and grown here chiefly on account of its unusual shape. It is more or less pointed at the extremities and generally curved, resembling a very large banana. A good yielder, free from netting and ribbing, sometimes slightly corrugated. The flesh

is salmon coloured, rather thin, but of good quality when freshly picked. This variety is sometimes grown as pig feed in parts of United States of America on account of its high yield.

Summary of Most Useful Varieties.

The following statement indicates the most useful varieties in the various groups and classifies them according to maturity:—

For Commercial Growing and Shipping.

Pollock Group—(*a*) Green fleshed—Delicious; (*b*) green fleshed, salmon, round seed cavity—Pollock 10-25; (*c*) salmon fleshed—Hales' Best.

Hoodoo Group—Paul Rose.

Honeydew Group—Honeydew, Large Persian.

For the Home Garden and Very Local Markets.

Jenny Lind Group—Improved Jenny Lind, Emerald Gem.

Netted Gem Group—Netted Gem.

Hackensack Group—Baltimore.

Fordhook Group—Irondequoit.

Osage Group—Miller Cream.

In addition to these, the varieties listed as being suited to commercial marketing are well worthy of a place in the home garden.

Classification of Above Varieties According to Maturity.

Early.	Mid-season.	Late.
Baltimore.	Delicious.	Honeydew.
Emerald Gem.	Irondequoit.	Large Persian.
Improved Jenny Lind.	Miller Cream.	
Netted Gem.	Paul Rose.	
Hales' Best.	Pollock 10-25.	

Nurserymen Supplied with Selected Citrus Buds.

The Co-operative Bud Selection Society, Ltd., has supplied the following selected Valencia Late orange buds to nurserymen during the 1929 budding season, trees from which should be available for planting in 1930:—

	Buds.
T. Adamson, Ermington	3,100
T. Eyles, Rydalmere	3,500
F. Ferguson and Son, Hurstville	1,500
R. Hughes, Ermington...	1,000
G. McKee, Ermington	3,000
L. P. Rosen and Son, Carlingford (late of Epping)	11,400
Swane Bros., Ermington	500

—C. G. Savage, Director of Fruit Culture.

Wheats Entered for the Royal Agricultural Society's Show, 1929.

Milling Tests and Awards.

G. W. NORRIS, Chemist's Branch.

The wheats entered for the Royal Agricultural Society's show this year were shown in the Farrer Court as in previous years, each exhibit being arranged, in a separate glass case, according to its class and catalogue number. There were two main classes, viz., the actual grain harvested from the plots of the Royal Agricultural Society's field wheat championship, and the entries for the Commonwealth championships. A large number of entries was attracted—sixty in the first class and fifty-six in the second.

The arrangements of the f.a.q. exhibits from various States in conjunction with the show samples was an outstanding feature this year. This afforded a splendid opportunity for those interested to make comparisons between the commercial and show samples, indicating the large amount of impurities to be found in the commercial samples, while the show samples were quite free in this respect (not even an undersized or pinched grain being detectable), and emphasised the necessity for the introduction of a grading system.

A general review of the exhibits this year shows that nearly all the states were represented, providing a record display, while the high standard of previous years was maintained. Some classes, such as Waratah and Canberra, were very uniform, and only by the most careful milling could they be separated. For example, in the Medium Strong Field Wheat Competition the first prize was won with a grand total of 89½ points; but, as will be seen from the table, only one point separated the next four exhibits.

The results of the milling and flour tests are as follows:—

RESULTS OF MILLING AND FLOUR TESTS.

	Appearance of Grain.	Weight per bushel.		Ease of Milling	Percentage of Flour.		Colour of flour.	Percentage of Gluten.		Strength.		Total Pts.
	—	Points.	Actual Weight.	—	Points.	Actual per cent.	—	Points.	Actual per cent.	Points.	Water Absorption.	
Max Points.	10	15	—	10	10	—	15	20	—	20	—	100
Cat. No.	**Class 1301 (Commonwealth Champion Prize—Strong White Wheat).**											
7529	8	13	66	8	9	73·0	14	16	12·2	20	56·4	88
7530	8	14½	67¾	8	10	74·8	12	14½	10·7	20	55·0	87
7531	9	14	67¼	8	10	74·8	13	15½	11·4	19½	54·4	89
7532	10	14	67¼	8	10	74·9	14	15	10·8	20	55·0	91
7534	8	13½	66¾	9	10	74·0	10	14½	10·7	19	54·0	84
7535	8	12½	65½	9	10	74·3	10	15½	11·5	16	51·2	81
7536	10	15	68	8	10	75·0	14	17½	13·6	17	52·0	91½
7539	10	14½	67½	9	10	74·5	11	17½	13·6	20	56·0	92
7540	10	13	66¼	9	10	74·5	15	19	14·9	15	50·0	91
7544	8	13	66¼	9	10	75·5	12	18	14·1	11	46·0	81

Results of Milling and Flour Tests—*continued.*

	Appearance of Grain.	Weight per bushel.		Ease of Milling	Percentage of Flour.		Colour of flour.	Percentage of Gluten.		Strength.		Total Pts.
	—	Points.	Actual Weight.	—	Points.	Actual per cent.	—	Points.	Actual per cent.	Points.	Water Absorption.	
Max Points.	10	15	—	10	10	—	15	20	—	20	—	100
Class 1302 (Commonwealth Champion Prize—Medium Strong Wheat).												
7533	7	14	67	10	8	72·0	12	13½	9·6	15	50·0	79½
7537	5	12½	65½	10	10	75·1	12	15½	11·8	15½	50·6	80½
7538	10	13	64¼	10	10	75·1	14	15½	11·8	15	50·0	87½
7545	10	14	67	10	10	74·0	13	14	10·0	17½	52·6	88½
7546	7	11½	64¾	10	10	73·9	12	12½	8·5	12	47·0	75
7547	8	12½	65½	10	10	74·9	12	13	9·3	12½	47·6	78
7548	8	13½	66¾	10	8	71·9	12	11	7·1	11½	46·6	74
7549	9	14	67¼	10	10	74·2	12	14	10·1	11	46·0	80
7550	7	11	64¼	10	10	74·2	13	15½	11·8	10	45·4	76½
7551	8	10½	63½	10	9½	73·5	14	16	12·3	12	47·4	80
7552	6	9½	62½	10	9½	73·5	13	15½	11·8	11	46·0	74½
7553	9	11	64¼	10	10	75·4	13	13½	9·7	12	47·2	78½
7554	6	10	63¼	10	7	71·3	12	11	7·1	14	49·0	70
7555	10	12½	65½	10	9	73·1	14	17	13·2	11	46·2	83½
7556	9	14	67¼	10	10	74·8	14	16	12·3	14	49·2	87
7557	7	12½	65½	10	9½	73·4	12	13	9·0	10	45·0	74
7558	8	12½	65½	10	10	75·2	12	12½	8·6	12	47·0	77
7559	7	13½	66½	10	8	72·2	12	13	9·0	12	47·0	75½
7560	7	12½	65¾	10	9	73·7	15	13½	9·4	11½	46·8	78½
7561	10	13	66¼	10	9	73·7	14	14½	10·8	13	48·4	83½
7562	7	12	65	10	9	73·5	15	19	15·1	13	48·0	85
7563	7	13	66	10	9	72·8	14	14	10·2	10½	45·8	77½
7564	9	12	65¼	10	10	73·9	14	15	11·2	11½	46·4	81½
7565	10	13½	66¾	10	10	74·1	15	15	10·8	9	44·0	82½
7566	8	12½	65¾	10	8	72·0	13	14	10·3	10½	45·6	76
7567	8	12½	65¾	10	10	74·5	14	18	14·2	12½	47·4	85
7568	8	13	66	10	9½	73·5	15	17½	13·6	12	47·0	85
7569	8	12	65¼	10	10	74·5	13	13½	9·6	12½	47·6	78
7570	8	12	65¼	10	8	72·2	13	13	9·1	12½	47·6	76½
7571	9	13½	66½	10	10	74·5	14	20	16·2	11	46·0	87½
7576	7	10	63	10	9	73·4	12	14	10·4	11½	46·8	73½
7577	7	11	64	10	10	74·4	15	16	12·4	11½	46·6	80½
7578	9	12	65	10	8	72·1	14	15	11·0	10½	45·6	78½
7579	8	11½	64¾	10	10	75·2	11	13	9·0	11½	46·8	75
7580	8	12½	65½	10	9½	73·8	15	14	10·1	10	45·2	79
7581	10	14	67	10	9	73·2	14	18	14·2	14½	49·4	89½
7582	8	10½	63½	10	9	73·2	14	15½	11·5	10½	45·6	77½
7583	9	12	65	10	10	74·3	13	14	10·0	12	47·0	80
Class 1800 (Strong Flour, Red).												
7523	9	13½	66¾	8	10	74·5	13	18½	14·6	17	52·0	89
7526	8	13	66	8	9½	73·5	12	20	17·0	17	52·2	87½
Class 1303 (Florence) [Special].												
7584	8	13½	66½	10	10	74·0	15	15½	11·5	11½	46·8	83½
7585	9	14	67¼	10	10	74·2	12	14	10·1	11	46·0	80
Class 1304 (Canberra) [Special].												
7587	10	13	66¼	10	10	74·1	14	15½	11·4	11	46·0	83½
7588	9	14	67	10	8	72·4	15	14	10·2	9	44·0	79
7591	10	13½	66¾	10	10	74·1	15	15	10·8	9	44·0	82½
7596	9	14	67	10	10	75·1	14	17½	13·4	10	45·0	84½

Results of Milling and Flour Tests—*continued.*

	Appearance of Grain.	Weight per bushel.		Ease of Milling	Percentage of Flour.		Colour of flour.	Percentage of Gluten.		Strength.		Total Pts.
	—	Points.	Actual Weight.	—	Points.	Actual per cent.	—	Points.	Actual per cent.	Points.	Water Absorption.	
Max. Points.	10	15	—	10	10	—	15	20	—	20	—	100
Class 1305 (Waratah) [Special].												
7602	10	14	67	10	9½	73·5	15	14½	10·6	8	43·0	81
7607	10	13½	66½	10	10	74·7	13	16½	12·6	9	44·0	82
7608	10	14	67¼	10	9½	73·5	13	14	10·1	9	43·8	79½
7617	10	13	66	10	9	73·1	12	16½	12·7	9½	44·4	80
Class 1306 (Union) [Special].												
7618	9	13	66¼	10	10	73·8	14	16	12·0	9½	44·4	81½
7620	8	13	66	10	10	74·5	15	14	10·0	9	44·0	79
Class 1307 (Bena) [Special].												
7627	9	12	65¼	10	10	73·9	14	15	11·13	11½	46·4	81½
7629	8	12½	65¾	10	10	74·5	14	18	14·2	12½	47·4	85
7630	8	12	65¼	10	10	74·5	13	13½	9·6	12½	47·6	79
Class 1308 (Federation, Novice).												
7637	8	12½	65¾	10	8	72·0	12	12½	8·5	8	43·0	71
7638	8	12	65	10	10	73·8	12	15	10·9	9	43·8	76
7639	10	12½	65¾	10	8	72·1	13	14	10·1	9	44·0	76½
Class 1309 (Federation, Open).												
7642	8	12½	65¾	10	8	72·0	12	12½	8·5	8	43·0	71
7644	9	12½	65¾	10	9	72·8	14	14½	10·5	9	44·2	78
Class 1310 (Hard Federation).												
7650	9	13	66¼	9	10	75·0	12	15½	11·7	13	48·2	81½
7653	9	12½	65¾	9	9½	73·6	14	14	10·3	13	48·0	81
Class 1311 (Weak Flour).												
7661	8	12½	65¾	10	10	73·9	15	13½	9·5	9	43·8	78
7664	10	15	68	10	10	74·3	13	19½	15·6	10	45·0	87½
7665	9	15	68	10	10	73·8	14	17	13·3	9½	44·4	84½
7666	8	13	66	10	9½	73·7	14	16½	12·6	9	44·0	80
7668	9	12½	65¾	10	9	72·8	14	14½	10·5	9	44·2	78
7671	10	13½	66½	10	10	74·7	13	16½	12·6	9	44·0	82
7672	10	15	68¼	10	9	73·2	14	17½	13·4	9½	44·4	85
7681	10	13	66	10	9	73·1	12	16½	12·7	9½	44·4	80
7682	8	12	65	10	9½	73·6	14	15½	11·8	10	45·0	79
Class 1314 (Strong White, Field Wheat Competition).												
7691	9	14	67¼	8	10	73·9	15	13	9·0	17	52·0	86
7692	10	14	67¼	8	10	74·9	14	15	10·8	20	55·0	91
Class 1315 (Medium Strong, Field Wheat Competition).												
7695	8	13½	66½	10	8	72·1	15	17	13·0	13	48·0	84½
7699	10	12½	65½	10	9	73·1	14	17	13·2	11	46·2	83½
7704	10	13½	66½	10	9½	73·7	14	16	12·4	11	45·8	84
7707	8	12	65¼	10	10	74·5	13	13½	9·6	12½	47·6	79
7714	10	13½	66¾	10	10	73·8	13	16	11·9	11	46·0	83½
7716	9	12	65	10	8	72·1	14	15	11·0	10½	45·6	78½
7719	10	14	67	10	9	73·2	14	18	14·1	14½	49·4	89½

Results of Milling and Flour Tests—*continued.*

	Appearance of Grain.	Weight per bushel.		Ease of Milling	Percentage of Flour.		Colour of flour.	Percentage of Gluten.		Strength.		Total Pts.
	—	Points.	Actual Weight.	—	Points.	Actual per cent.	—	Points.	Actual per cent.	Points.	Water Absorption.	
Max Points.	10	15	—	10	10	—	15	20	—	20	—	100
Class 1316 (Weak Flour, Field Wheat Competition).												
7726	8	12	65	10	10	73·8	12	15	10·9	9	43·8	76
7730	10	13	66	10	10	73·9	13	17	12·9	10½	45·4	83½
7732	10	13½	66¾	10	8½	72·6	15	14	10·3	10	45·0	81
7733	10	12½	65¾	10	9	73·0	15	17	12·8	10	45·2	83½
7734	10	13½	66½	10	8	72·4	14	18	14·0	11	46·0	84½
7736	9	12½	65¾	10	8	72·2	15	15	11·3	10½	45·6	80
7750	10	13	66	10	9	73·1	12	16½	12·7	9½	44·4	80
7750A	8	12	65	10	9½	73·6	14	16	11·8	10	45·0	70½

JUDGING OF WHEATS IN CLASSES WHICH WERE NOT SUBMITTED TO MILLING TEST.

Catalogue No.	Variety.	Weight per bushel.		Appearance of Grain.	Trueness to Type.	Uniformity of Grain.	Total Points.
		Actual Weight.	Points.				
	Maximum Points ...	—	15	10	10	10	45
	Class 1312 (Collection Five Farrer Wheats.)						
7683	Canberra	67	14	9	10	10	43
	Cedar	66¾	13½	9	10	10	42½
	Florence	66½	13½	9	10	10	42½
	Hard Federation	66¼	13	9	10	10	42
	Waratah	66¾	13½	9	10	10	42½
							212½
7684	Bena	65½	12½	8	8	8	36½
	Federation ...	64¾	11½	9	10	9	39½
	Hard Federation	64¾	11½	9	10	10	40½
	Nabawa	64	11	8	8	8	35
	Waratah	66	13	10	10	10	43
							194½
	Class 1313 (Collection Five Non-Farrer Wheats).						
7686	Ghurka	67¼	14	9	9	9	41
	Perfection ...	66½	13½	9	9	8	39½
	Petatz Surprise...	68	15	10	10	10	45
	Pusa No. 4 ...	67¼	14	9	10	9	42
	Satisfaction ...	67	14	9	9	9	41
							208½
7687	Baldwin	64¾	11½	7	10	8	36½
	Bruce	65½	12½	9	10	10	41½
	Gallipoli	64	11	7	8	6	32
	Nizam	65¾	12½	8	10	10	40½
	Ranee	64½	11½	8	9	9	37½
							188

Judging of Wheats in Classes which were not Submitted to Milling Test—*continued.*

Catalogue No.	Variety.	Weight per bushel: Actual Weight.	Weight per bushel: Points.	Appearance of Grain.	Trueness to Type.	Uniformity of Grain.	Total Points.
	Maximum Points ...	—	15	10	10	10	45
	Class 1818 (Collection of Five Non-Farrer Wheats)—*continued.*						
7688	Carrabin	67¼	14	10	10	10	44
	Ford	68	15	10	10	10	45
	Petatz Surprise...	68	15	10	10	10	45
	Punjab 17 ...	68	15	10	10	10	45
	Pusa No. 1 ...	67½	14½	8	10	8	40½
							219½
7690	Dura	65½	12½	9	10	10	41½
	Marshall's No. 3	65	12	8	8	8	36
	Perfection ...	67	14	8	9	9	40
	Quality	66¼	13	9	9	9	40
	Queen Fan ...	65¾	12½	9	8	8	37½
							195

AWARDS.

Class 1300— Strong Red.

First Prize (No. 7523)—Mrs. J. Berney. Variety, Cedar; grown at Eurimbla, New South Wales, on red loam; seed per acre, 58 lb.; yield per acre, 28 bushels; rainfall during growth, 7 inches; fallow.

Second Prize (No. 7526)—S. J. Plowman. Variety, Cedar; grown at Goonumbla, New South Wales, on clay loam; seed per acre, 42 lb.; yield per acre, 22 bushels; rainfall during growth, 8.5 inches; fallow.

Class 1801— Commonwealth Champion Prize, Strong White.

(No. 7539)—J. K. Hebiton, junr. Variety, Comeback; grown at Three Springs, Western Australia, on red loam; seed per acre, 56 lb.; yield per acre, 26 bushels; rainfall during growth, 8.61 inches; fallow.

Class 1802— Commonwealth Champion Prize, Medium Strong.

(No. 7581)—W. Tonkin. Variety, Perfection; grown at Delungra, New South Wales, on heavy black soil; seed per acre, 50 lb.; yield per acre, 30 bushels; rainfall during growth, 13.43 inches; autumn ploughing.

Class 1303— Special, Florence.

First Prize (No. 7584)—Mrs. J. Berney. Grown at Eurimbla, New South Wales, on red loam; seed per acre, 56 lb.; yield per acre, 25 bushels; rainfall during growth, 7 inches; fallow.

Second Prize (No. 7585)—J. M. Carroll. Grown at Northam, Western Australia, on light soil; seed per acre, 75 lb.; yield per acre, 15 bushels; rainfall during growth, 14 inches; autumn ploughing.

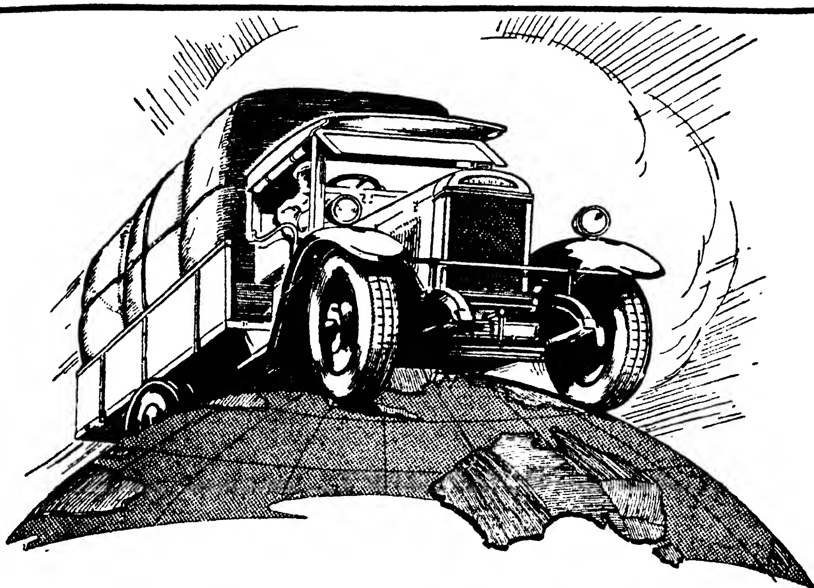
Class 1804— Special, Canberra.

First Prize (No. 7596)—T. W. Upperton. Grown at Quirindi, New South Wales, on black soil; seed per acre, 50 lb.; yield per acre, 34 bushels; rainfall during growth, 8.74 inches; fallow.

Second Prize (No. 7587)—Miss E. W. Allnutt Grown at Tregantle on black soil; seed per acre, 50 lb.; yield per acre, 28 bushels; rainfall during growth, 10 inches; autumn ploughing.

Awards—*continued.*

Class 1305— Special, Waratah.	First Prize (No. 7607)—D. O'Neil. Grown at Bowan Park on basalt soil; seed per acre, 60 lb.; yield per acre, 30 bushels; no record of rainfall; fallow. Second Prize (No. 7602)—E. Lewis. Grown at Grenfell on red loam; seed per acre, 69 lb.; yield per acre, 29 bushels; no record of rainfall, fallow.
Class 1306— Special, Union.	First Prize (No. 7618)—J. D. Berney. Grown at Eurimbla on red loam; seed per acre, 60 lb.; yield per acre, 27 bushels; rainfall during growth, 8 inches; fallow. Second Prize (No. 7620)—E. H. G. Eldershaw. Grown at Marrar on light red loam; seed per acre, 75 lb.; yield per acre, 29 bushels; rainfall during growth, 8.39 inches; fallow.
Class 1307— Special, Bena.	First Prize (No. 7629)—A. R. Michael. Grown at Woomelang, Victoria, on heavy loam; seed per acre, 48 lb.; yield per acre, 9.75 bushels; rainfall during growth, 4.75 inches; fallow. Second Prize (No. 7627)—E. Lewis. Grown at Grenfell on red loam; seed per acre, 60 lb.; yield per acre, 36 bushels; no record of rainfall; fallow.
Class 1308— Special, Federation (Novice).	First Prize (No. 7639)—J. Mahon. Grown at Quandialla on sandy clay loam; seed per acre, 60 lb.; yield per acre, 34 bushels; rainfall during growth, 7 inches; fallow. Second Prize (No. 7638)—T. M. Dunn. Grown at Condobolin on heavy loam; seed per acre, 45 lb.; yield per acre, 37 bushels; rainfall during growth, 3.17 inches; fallow.
Class 1309— Special Federation (Open).	First Prize (No. 7644)—Mailer Bros. Grown at Trundle, on chocolate loam; seed per acre, 60 lb.; yield per acre, 30 bushels; rainfall during growth, 4.87 inches; fallow. Second Prize (No. 7642)—Mrs. J. Berney. Grown at Eurimbla on red loam; seed per acre, 56 lb.; yield per acre, 24 bushels; rainfall during growth, 7 inches; fallow.
Class 1310— Special Hard Federation.	First Prize (No. 7650)—Mrs. J. Berney. Grown at Eurimbla on red loam; seed per acre, 58 lb.; yield per acre, 20 bushels; rainfall during growth, 7.1 inches; fallow. Second Prize (No. 7653)—E. Jones. Grown at Narromine on medium loam; seed per acre, 60 lb.; yield per acre, 30 bushels; rainfall during growth, 4.69 inches; fallow.
Class 1311— Weak Flour.	First Prize (No. 7664)—J. W. Eade. Variety, Petatz Surprise; grown at Euchareena on cholocate loam; seed per acre, 45 lb.; yield per acre, 24 bushels; no record of rainfall; fallow. Second Prize (No. 7672)—S. J. Plowman. Variety, Petatz Surprise; grown at Goonumbla on clay loam; seed per acre, 56 lb.; yield per acre, 25 bushels; rainfall during growth, 8.5 inches; fallow.
Class 1314— Strong White. Field Wheat Competition.	First Prize (No. 7692)—Boxsell Bros. Variety, Pusa No. 4; grown at Junee, New South Wales, on red loam; seed per acre, 75 lb.; yield per acre, 30 bushels; rainfall during growth, 7.7 inches; fallow. Second Prize (No. 7691)—Mrs. J. Berney. Variety, Ghurka; grown at Eurimbla on red loam; seed per acre, 60 lb.; yield per acre, 28 bushels; rainfall during growth, 7.2 inches; fallow.



Awards—*continued.*

Class 1315—

Medium Strong. Field Wheat Competition.

First Prize (No. 7719)—W. Tonkin. Variety, Perfection; grown at Delungra on heavy black soil; seed per acre, 50 lb.; yield per acre, 30 bushels; rainfall during growth, 13.43 inches; autumn ploughing.

Second Prize (No. 7695)—Mrs. J. Berney. Variety, Perfection; grown at Eurimbla on red loam; seed per acre, 60 lb.; yield per acre, 29 bushels; rainfall, 7 inches; fallow.

Class 1316—

Weak Flour. Field Wheat Competition.

First Prize (No. 7734)—J. W. Hawthorne. Variety, Waratah; grown at Ardlethan on medium loam with clay subsoil; seed per acre, 72 lb.; yield per acre, 28 bushels; no record of rain; fallow.

Second Prize (No. 7733)—Hampton Bros. Variety, Waratah; grown at Grenfell on chocolate loam; seed per acre, 70 lb.; yield per acre, 33 bushels; rainfall during growth, 7.68 inches; fallow.

Second Prize (No. 7730)—H. M. Gooden. Variety, Turvey; grown at Narrandera on red sandy loam; seed per acre, 65 lb.; yield per acre, 32 bushels; rainfall during growth, 5 inches; fallow.

Class 1312—

Collection of Five Farrer Wheats.

First Prize (No. 7683)—Mrs. J. Berney. Varieties, Canberra, Cedar, Florence, Hard Federation, Waratah; grown at Eurimbla on red loam; seed per acre, Canberra and Waratah 60 lb., Cedar and Hard Federation 58 lb., Florence 56 lb.; yield per acre, Canberra 26 bushels, Cedar 28 bushels, Florence 25 bushels, Hard Federation 20 bushels, Waratah 24 bushels; rainfall during growth, Canberra 7.4 inches; Cedar and Florence, 7 inches; Hard Federation, 7.1 inches; Waratah, 6.2 inches; fallow.

Second Prize (No. 7684)—E. W. Dahlenburg. Varieties, Bena, Federation, Hard Federation, Nabawa and Waratah; grown at Salesbury, Victoria, on sandy loam; Federation and Bena on black loam; seed per acre, 70 lb.; yield per acre: Bena 18 bushels, Federation 15 bushels, Hard Federation 33 bushels, Nabawa 12 bushels, Waratah 24 bushels; rainfall during growth, 6.89 inches; Bena and Hard Federation on fallowed ground; Federation, Nabawa and Waratah on autumn-ploughed ground.

Class 1313—

Collection of Five Non-Farrer Wheats.

First Prize (No. 7688)—J. W. Eade. Varieties Carrabin, Ford, Patatz Surprise, Pusa No. 1 and Punjab No. 17; grown at Euchareena on chocolate loam; seed per acre, 45 lb.; yield per acre: Carrabin, Petatz Surprise and Punjab No. 17, 24 bushels, Ford 30 bushels, Pusa No. 1, 21 bushels; no record of rainfall; fallow.

Second Prize (No. 7686)—Mrs. J. Berney. Varieties Ghurka, Perfection, Petatz Surprise, Pusa No. 4 and Satisfaction; grown at Eurimbla on red loam; seed per acre: Ghurka, Perfection, Petatz Surprise and Pusa No. 4, 60 lb.; Satisfaction 56 lb.; yield per acre: Ghurka 28 bushels, Perfection 29 bushels, Petatz Surprise 26 bushels, Pusa No. 4, 25 bushels, Satisfaction 20 bushels; rainfall during growth: Ghurka 7.2 inches, Perfection 7 inches, Petatz Surprise 6.2 inches, Pusa No. 4 and Satisfaction 7.1 inches; fallow.

Comments.

In the Commonwealth championship classes there was a slight improvement from a strength point of view, the highest being 56.4 against 55.5 of the previous year, while the gluten content was about the same.

The Strong White Championship was won by Mr. J. K. Hebiton, junior, of Three Springs, Western Australia, with the consistent prizewinner Comeback. This was undoubtedly a good wheat, exhibiting all the characteristics of the variety. Its flour secured full points for appearance, yield of flour, water absorption, and almost maximum for bushel weight. Even then it only secured a half point lead, while the next three were separated by one point only. Punjab No. 17, Wangan, Pusa No. 4 are worthy of mention, and were responsible for the close finish.

A most remarkable coincidence is the fact that the champion prize for a medium strong wheat (won by Mr. Tonkin, of Delungra, with the variety Perfection—an attractive wheat scoring 89½ points) was won by the same competitor with the same variety last year. Perfection is a good milling wheat, yielding over 73 per cent. of flour, rich in gluten, with a water absorption of 49.4, which is high when compared with flour made from f.a.q. wheat, 43 or 44 being the usual figure.

Other wheats in this class worthy of special mention are Union and Ford, grown in New South Wales, and Nizam, from Victoria.

In the Society's field wheat competitions, first prize in the Strong Flour class was easily won by Boxsell Bros., of Junee, with a total of 91 points. This exhibitor placed his faith in Pusa No. 4, his sample undoubtedly being an attractive wheat.

The Medium Strong class was keenly contested. The first prize went to Mr. W. Tonkin, of Delungra, with a sample of Perfection, already commented upon in the Commonwealth Championship class. Second prize went to Mrs. J. Berney with the same variety, which gained 84½ points.

First prize in the Weak Flour class was gained by Mr. W. J. Hawthorne with Waratah, scoring 84½ points, while the second prize was divided between Hampton Bros. (also Waratah) and H. M. Gooden with Turvey, each scoring 83½ points. There is no doubt about the popularity of Waratah; out of a total of thirty entries in this class twenty-one were of Waratah.

Infectious Diseases Reported in October.

The following outbreaks of the more important infectious diseases were reported during the month of October, 1929:—

Anthrax	1
Blackleg	8
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia contagiosa	10
Swine fever	Nil.
Contagious pneumonia	Nil.

—Max Henry, Chief Veterinary Surgeon.

Farm Forestry.

V. The Native and Introduced Trees of New South Wales.

[Continued from page 786.]

R. H. ANDERSON, B.Sc.Agr., Assistant Botanist, Botanic Gardens, Sydney, and Lecturer in Forestry, University of Sydney.

THE TABLELAND DIVISION—*continued.*

Other Native Trees.

THE Kurrajong (see *Agricultural Gazette,* Vol. XXXIX, page 619) occurs here and there scattered through the Tableland Division.

Exocarpus cupressiformis (Native Cherry) and *Jacksonia scoparia* (Dogwood), both of which are described in the *Agricultural Gazette,* Vol. XXXIX, p. 923, are found more or less plentifully throughout the Division. The Dogwood is especially abundant in the northern subdivision, on blue granitic soils.

Other trees occurring include the following species:—

BLACK SHE-OAK (*Casuarina suberosa*).

A small erect tree, rarely exceeding 40 feet in height, occurring fairly commonly on poor sandstone soils in both Tablelands and Coastal Divisions. The bark is usually hard, rugged and rather corky, but is not so corky as that of other She-oaks.

"Branchlets usually ascending, the teeth six to eight in the whorl. Cone cylindrical oblong, glabrous, about ½-¾ inch diameter."

The exact limitation of this species is not altogether satisfactory. Further investigations may show that two distinct species are included under the one name. It is therefore necessary to obtain seed from well grown trees of the type desired, if plantings are to be made.

Uses: Well grown trees make excellent small shelter trees for minor purposes, and are also distinctly ornamental in appearance. The reddish timber is fissile and used to some extent for shingles, etc., but tends to warp a good deal in drying. It makes very good fuel.

FOREST OAK (*Casuarina torulosa*).

A small to medium sized rough-barked tree, occasionally reaching 70 feet in height, found in both Tablelands and Coastal Divisions, but not so commonly in the former as *Casuarina suberosa* (Black She-oak). The branchlets are very slender and drooping. It usually occurs on fairly moist better-class soils, although occasionally found in less favourable sites. Generally speaking, however, it prefers fairly fertile soils

in comparison with the poorer classes inhabited by *Casuarina suberosa.* It is frequently associated as an understory with taller growing species of Eucalyptus.

"Branchlets slender, smooth, the teeth usually four in the whorl. Cones nearly globular to barrel-shaped, about ⅝ inch diameter, villose."

Uses: This species is ornamental and useful as a small shelter tree. The reddish timber is fairly heavy and strong and can be used for rough purposes, in addition to making an excellent fuel. The timber is also used to a small extent for shingles and for small fancy furniture, having a rather handsome figure.

BULL OAK (*Casuarina Luehmanni*) is mainly a species of the Western Plains and Slopes Divisions (see *Agricultural Gazette,* Vol. XXXIX, page 620), but is not uncommon in parts of the Tablelands Divisions at lower elevations on the western side. It occurs fairly plentifully on the watersheds of the Upper Hunter and Goulburn rivers, and is found as far south as Queanbeyan on sites sheltered from cold southern influences. In the north it ascends to an elevation of over 3,000 feet, growing mainly on river flats and blue granitic soil.

DROOPING SHE-OAK OR MOUNTAIN OAK (*Casuarina stricta*), which has been more fully described in the *Agricultural Gazette,* Vol. XXXIX, page 922, is also found in the Tablelands Division, particularly in the southern subdivision.

RIVER OAK (*Casuarina Cunninghamii*) occurs in a number of Tablelands localities, occupying its usual position along the banks of watercourses (see *Agricultural Gazette,* Vol. XXXIX, page 921).

Casuarina nana is found in the central and southern subdivisions, but is only a small shrub, rarely attaining any size, and is of little importance.

MUELLER'S CYPRESS PINE (*Callitris Muelleri*).

A small tree of pyramidal habit, occasionally reaching 40 feet in height, but frequently reduced to a shrub under Tableland conditions. It is found in the southern and central subdivisions of both the Coast and Tablelands, and most commonly occurs on rocky sandstone soils in rather exposed stiuations.

"Branchlets very angular. Cones almost globular, about 1 inch diameter, the scales usually rugose and with a small point below the summit."

Uses: Well grown trees are ornamental and the species is perhaps worthy of cultivation, more especially on sandy soils, both for decorative purposes and as a small breakwind. The timber is of no particular merit and is little used owing to the abundant supply of better-class Eucalypts.

COAST CYPRESS PINE (*Callitris cupressiformis*) is mainly confined to the Coastal Division, but is found in one or two Tableland districts.

Black Cypress Pine (*Callitris calcarata*) (see Western Slopes Division for full description) is not uncommon in many portions of the Division, being fairly plentiful in the Cooma district, extending north to Emmaville. It is mainly restricted to the ridges on the western side of the Division, but crosses to the eastern side in parts.

Honeysuckles (*Banksia* spp.).

Several of the Honeysuckles occur in the Division, the most important being *Banksia marginata* and *Banksia integrifolia.*

Honeysuckle (*Banksia marginata*).

Honeysuckle (*Banksia marginata*) is a shapely shrub or small tree up to 35 feet in height with a fairly dense crown. It is found in all three subdivisions, but mainly in the southern and central ones, reaching its best development in the south. It also extends to the Coastal Division.

"Leaves obtuse or retuse, 1 to 3 inches long, mostly scantily denticulate, white underneath with a close tomentum."

Uses: It makes a useful small shelter tree for stock, and is fairly ornamental. The soft porous timber is reddish in colour and warps badly on drying. If carefully seasoned it may be used for small articles of an ornamental character.

WHITE HONEYSUCKLE (*Banksia integrifolia*) varies in size from a shrub to a medium-sized tree, occasionally reaching 60 feet in height. In the northern subdivision it makes good growth, particularly on sandy granitic soils in the eastern portion. In the central subdivision it is not uncommon on the Blue Mountains, but is usually stunted in form, although reaching over 50 feet at Mount Wilson. It is also common in the Coastal Division.

"Leaves acute, mostly quite entire, some almost crowded into whorls, whitish underneath with a close tomentum."

Uses: It has some little use as a shelter and ornamental tree. The pinkish coloured timber has a rather attractive grain and has been used for a number of minor purposes, such as walking sticks, wooden screws, etc. It is sometimes recommended for planting on sandy coastal soils for ornamental purposes. Like most of the Banksias, it can be propagated from seed.

APPLES (*Angophora* spp.).

Angophora intermedia (see *Agricultural Gazette,* Vol. XXXIX, page 919) is found in a number of Tableland localities, especially in the north, but makes its best development below an elevation of 2,000 feet.

BROAD-LEAVED APPLE (*Angophora subvelutina*) is fairly common in parts of the northern subdivision, and is represented by a few scattered trees in the central subdivision.

SMOOTH-BARKED APPLE (*Angophora lanceolata*) is also found in one or two Tableland localities, but is typically a coastal tree. Both the last-mentioned species will be more fully described under the Coastal Division.

Species of Minor Importance.

A number of *Hakea* spp. occur in the Division, including *H. saligna, H. dactyloides, H. eriantha, H. Macreana, H. acicularis, H. microcarpa* and *H. pugioniformis.* In this group the plants rarely grow larger than tall shrubs and are distinguished by the hard woody fruits opening in two valves. The leaves are either needle-like or flattened. *Hakea saligna* occasionally reaches the size of a small tree and the timber is used to some little extent for tool handles. It is found mainly in the central and northern subdivisions. *Hakea dactyloides* occurs fairly commonly in all three subdivisions, but rarely exceeds 15 feet in height.

Notelaea microcarpa is an ornamental shrub or small tree found in the Tableland Division, and extending as far west as Narrabri and Gunnedah. It is most common in the northern subdivision, often on dry stony sites. It is regarded as fair fodder in some districts, but is apparently untouched by stock in others.

Notelaea linearis is a shrubby plant fairly widely distributed in the central and northern subdivisions, and extends down the North-west Slopes.

Myrsine variabilis occurs as a shrub or small tree in a number of Tableland districts, although mainly a coastal species. It forms an attractive little tree up to 40 feet in height, and bears a profusion of small globular white to purplish fruits. The whitish wood is hard and occasionally used for minor purposes.

Black Sassafras (*Atherosperma moschatum*) is a small to medium sized tree found scattered throughout the Division, chiefly in gullies and sheltered situations. The bark has a pleasant odour due to the presence of a volatile oil. The timber is moderately light and strong and is occasionally used for cabinet and turnery work.

Two species of *Drimys* (Native Pepper Trees) occur in the Division, viz., *Drimys aromatica* and *Drimys dipetala*. These are shrubs or small trees with a fairly strong aromatic odour. *D. aromatica* is found in all three subdivisions, but is mainly confined to the southern subdivision, being generally found in fairly moist situations. It rarely exceeds a shrub in size. *D. dipetala* is rather larger, occasionally forming a small tree, and is found both in the Tableland and Coastal Divisions in all three subdivisions. Both the leaves and berries of this species are larger than those of *D. aromatica*.

Native Currant (*Leptomeria acida*) is a shrub with slender angular branches, rudimentary or absent leaves, and small, succulent, edible fruits. It is found both in the Coastal and Tableland Divisions.

Native Pear (*Xylomelum pyriforme*) is a tall shrub or small tree with fairly large, opposite, strongly veined leaves and a hard, woody, pear-shaped fruit usually found in sandstone country at lower elevations on the eastern side, where it makes its way up from the Coastal Division. Although an interesting plant, it is of no importance.

Several of the *Callistemons* (Bottle Brushes) are found in their customary habitats, along watercourses, in the Tableland Division, the only one attaining tree size being *Callistemon viminalis*. This is one of the Red Bottle Brushes, varying in size from a tall shrub to a small tree, although occasionally reaching 60 feet in height. The branches are usually pendulous and the bark coarse and persistent. The timber is strong, tough, and may be suitable for tool handles, etc. It is durable underground and is occasionally used for fence posts in damp ground. The species is also distributed throughout the Coastal Division.

A number of species of *Leptospermum* and *Melaleucas* (Tea Trees) are also found in the Tableland Division, but none of them is of importance as a tree.

Panax sambucifolius occurs as a rather handsome shrub rarely exceeding 12 feet in height, and is widely distributed throughout the Division.

Musk Tree (*Olearia argyrophylla*) is found in a few Tableland localities as well as Coastal. It is one of the largest Composites in the world, sometimes exceeding 20 feet in height, and is distinguished by its large leaves, which are silvery underneath.

Orites lancifolia occurs as a fairly tall shrub in the higher portions of the Southern Tablelands.

As mentioned previously, a few patches of rain forests or brushes exist in the Tablelands Division, chiefly on basaltic soils. Among the species composing these are found a number of typical coastal trees, and, in addition, a few coastal species are found in sheltered gullies mainly on the eastern side. The more important species composing such an intrusion of the coastal flora include—*Doryphora sassafras* (Sassafras), *Ceratopetalum apetalum* (Coachwood), *Schizomeria ovata* (White Cherry), *Quintinia Sieberi* (Opposum Wood), *Elaeocarpus reticulatus* (Blueberry), *Hedycarya angustifolia* (Bastard Mulberry), *Pittosporum undulatum* (Pittosporum), *Backhousia myrtifolia* and *Nephelium leiocarpum* (Wild Quince).

Introduced Trees of the Tableland Division.

A fairly wide range of exotic trees have been grown in the Tableland Division from time to time, mainly for ornamental purposes. The various groups are dealt with below, and for the sake of compactness all the species within a group which are grown in this State are mentioned, although a few of these may be grown mainly in other Divisions.

PINES (*Pinus* spp.)

Several of these do well in the Tableland Division, notably *Pinus radiata*, which is grown to a very large extent. The Pines are fully dealt with at page 49, *Agricultural Gazette*, January, 1929.

OAKS (*Quercus* spp.)

A large number of Oak species are included in the genus *Quercus*, some of which have been grown in various parts of New South Wales. The Oaks, generally speaking, require a deep, fairly rich and heavy soil and a good rainfall, and although slow growing, are usully very hardy when once established. Many of the species, however, are not suitable for our conditions, and as a rule the evergreen species do better than the deciduous ones, the most successful species being *Quercus virginiana* (American Live Oak) and *Quercus Ilex* (Holm or Holly Oak). Both of these are useful shade and avenue trees, doing well in many districts, but possibly best suited to the Coastal Division.

ENGLISH OAK (*Quercus Robur*) has been planted in many districts for reasons of sentiment, and occasionally makes good development. More frequently, however, its growth is poor and liable to disease, and it is not well adapted to our conditions.

CORK OAK (*Quercus suber*) is a fairly hardy evergreen tree which does moderately well in the Coastal and Tableland Divisions. It is, however, slow growing and rarely reaches any large size, but makes fair shade and ornamental trees. Cork is obtained from the bark of this species.

GREY OR BAN OAK (*Quercus incana*) does quite well, especially in Coastal Divisions, forming a large shady tree with handsome leaves. It is useful mainly as a shade and avenue tree, although the bark is employed for tanning purposes.

LIVE OAK (*Quercus agrifolia*) is a low round-topped tree with short trunk and widely spreading branches. Although deciduous or semi-deciduous in its native habitat in America, all specimens seen here appear to be evergreen. It is widely distributed in California and covers fairly extensive areas of sand dunes, &c., along the coast. A well grown specimen in the Sydney Botanic Gardens indicates that this species is suitable for parts of the Coastal Division, being particularly useful as a shade, shelter or ornamental tree. It is, however, a slow growing species.

SCARLET OAK (*Quercus coccinea*) is a deciduous species with brilliant scarlet leaves in the autumn. It can be grown in parts of the Tableland Division for ornamental purposes.

Live Oak (*Quercus agrifolia*).

PIN OAK (*Quercus palustris*) is a useful ornamental and street tree for the Tableland Division. It is deciduous, very frost hardy, fairly fast growing, and is not so susceptible to disease as many of the other Oaks. It appears to thrive both in moderately wet and fairly dry soils and produces fine autumn foliage.

TURKEY OAK (*Quercus cerris*) is a deciduous species which does quite well both in the Coastal and Tableland Divisions, but is not grown to any extent.

POPLARS (*Populus* spp.).

The various species of Poplars have been grown fairly extensively in New South Wales, especially in the colder parts, as avenue trees and for breakwinds or landscape work. The genus, however, includes some thirty-four species, only a few of which have been cultivated in this State.

The Poplars are fairly fast growing, deciduous or sub-evergreen trees, with the sexes on separate individuals. They are moisture-loving trees, but do not tolerate water-logged soils and will not thrive on badly drained sites, although periodical inundations do little harm. They make their

Poplars at Tumut.

best development on rich, well drained loamy soils with a good supply of subsoil moisture, but do quite well on a fairly wide range of soils provided there is sufficient moisture available. They are essentially cold climate trees, doing best where the winters are most severe, but require some shelter from high winds, as the branches are rather brittle.

Poplar timber is much used in other parts of the world for match-making, a use for which it is particularly adapted. It is also employed in case making and for plywood and paper pulp. In New South Wales, however, the Poplars are chiefly grown as ornamental and avenue trees, although suitable for shelter belts and for the protection of river banks from erosion. Many of the species sucker badly, an undesirable characteristic in many respects, but of advantage when grown for bank protection. Propagation is secured from root suckers or cuttings, according to the habit of the particular species. Cuttings are taken from side branches of two seasons' growth or from stool shoots.

The nomenclature of the different species is very confusing, but they can be divided on a broad basis into three classes, White, Black and Balsam Poplars. White Poplars have smooth bark on the young stems, and some of the leaves, in addition to the young twigs and buds, are covered on the undersurface with a white woolly tomentum. Black Poplars have a furrowed bark and the leaves are green on both sides. Balsam Poplars are characterised by their fragrant foliage and buds, and their leaves are generally paler on the underside.

The following are the principal species cultivated in this State:—

White Poplar or Silver Poplar (*Populus alba*), a tall growing species which suckers profusely. It grows well in the Tableland Division, and also on parts of the coast. The variety *pyramidalis* (syn. var. *Bolleana*) has less tendency to sucker and is therefore better suited for specimen trees, windbreaks, etc.

Grey Poplar (*Populus canescens*), a species closely resembling the White Poplar superficially. It also suckers profusely, but is fairly tolerant of the poorer classes of soils.

Lombardy Poplar (*Populus nigra* var. *italica*) is a tree of upright columnar habit largely grown for avenues and shelter belts or for formal effects in landscape work, such as sentinels on either side of entrance gates, etc. It varies a good deal in the degree of its suckering and stands dry conditions rather better than many of the other Poplars.

Cottonwood (*Populus deltoides* and the var. *missouriensis*), a vigorous fast growing species with rather spreading graceful branches and a fairly open head. It is one of the most ornamental of the genus, the large glossy leaves being particularly handsome. It does well in many parts, but is one of the most exacting of the Poplars in regard to soil requirements, preferring a deep, moist, alluvial soil. The timber is inferior to some of the other species, but the tree is distinctly useful for shelter and ornamental purposes.

Other species commonly grown in other parts of the world but which have been little or not at all cultivated in New South Wales include *Populus seratina* (Hybrid Cottonwood), a very frost resistant species but which requires a good deal of moisture, *Populus balsamifera* (Balsam

Poplar) and *Populus Wislezenii* (Wislezen's Poplar), a short-boled, fairly wide crowned species useful for shade purposes, particularly on river banks, although moderately drought hardy.

Willows (*Salix* spp.)

Within this group of deciduous trees are included a large number of species, only a very few of which have been grown in this State. Willows do best where the soil moisture content is high, and will grow quite well in saturated soil, provided the water is not stagnant. If planted along water that is more or less stagnant they require to be placed a little away from the water line on somewhat drier ground. They are very hardy to cold conditions, and are especially suitable for cold moist localities, but require fairly good soil.

The various species of Salix are known as Willows, Osiers or Sallows. The term Osier is usually applied to the many forms of *Salix viminalis,* which produce long shoots of tough flexible wood used in basket making, etc. The Sallows include the shrubby species grown for ornamental purposes.

The most commonly planted of the Willows in this State, and one which has achieved such a marked degree of success and popularity, is the Weeping Willow (*Salix babylonica*). For river-side planting, this species stands practically in a class by itself, doing much useful work in holding the banks together, apart from adding a fresh beauty to our somewhat sombre landscapes. It is also a useful tree for summer shade and shelter, and provides useful stock feed for bad periods. It is occasionally used for live fence posts in wet ground. Propagation is readily secured from cuttings.

White Willow (*Salix alba*) is a large tree commonly cultivated in Eastern North America and Europe, and occasionally grown along water-courses in Australia. The variety *coerulea* (syn. *Salix coerulea*) is the Cricket Bat Willow from which the best bats are made. It is a very local form, being limited to one of two counties in England, but it should grow in the cooler moister parts of this State. The variety *vitellina* is distinguished by the bright yellow colour of the bark of the shoots. It is grown for ornamental purposes and to some extent for the bark, which forms a good binding material.

Basket Willow or Osier (*Salix viminalis*) includes a number of forms which are most commonly grown for the long tough rods they furnish. These are used for basket making, etc., and although unimportant in Australia, provide small industries in European countries.

Crack or Snap Willow (*Salix fragilis*) is a large tree more erect in habit than the Weeping Willow. Although not grown in this State it might well be planted along with the latter species.

Pussy Willow, Goat Willow (*Salix caprea*) is a small growing species with long canes. It is cultivated for decorative purposes, the long catkins of flowers being very attractive and long lasting when cut.

(*To be continued.*)

Standardisation of Australian Wools.

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THIS article details the results of an examination of wool samples forwarded by Mr. E. A. Elliott, Sheep and Wool Expert, New South Wales Department of Agriculture, to Professor Duerden.

Some years ago Mr. F. B. Hinton, then Sheep and Wool Expert, forwarded some samples to the Professor, whose work in connection with the standardisation of qualities led to his interest in Australian wools. In furtherance of these studies, Professor Duerden requested further samples, and in February of this year Mr. Elliott despatched eleven samples, all of which he had carefully selected and afterwards submitted to several wool valuers, who agreed that the samples were truly representative of the quality counts as recognised in Australia.

Professor Duerden's report, which is printed below, contains a good deal to interest sheep breeders and others connected with the wool industry.

Fibre Thickness as a Basis for Standardisation.

An effort has been in progress for some time to effect a standardisation of South African wools based upon their average fibre thickness. Large numbers of samples of each of the recognised qualities have been procured from woolmen of experience and repute, and have been submitted to microscopic measurement. In this way it has been possible to obtain the average thickness of the wools classed under each quality, and also the range of thickness for each quality. The results arrived at are given in Table 1. The technique involved in the study is somewhat complex and will not be given in this article.

TABLE 1.—*Average Thickness, Standard Thickness Limits, and Range of Limits of the various Qualities of Wool.*

Quality.	Average Thickness.	Standard Thickness Limits.	Range of Limits.
	microns.*	microns.	microns.
150's	14·24	14·0 to 14·7	0·7
120's	14·89	14·7 to 15·4	0·7
100's	15·61	15·4 to 16·2	0·8
90's	16·76	16·2 to 17·0	0·8
80's	17·61	17·0 to 17·9	0·9
70's	18·48	17·9 to 18·9	1·0
66's	19·66	18·9 to 20·0	1·1
64's	20·58	20·0 to 21·3	1·3
60's	21·89	21·3 to 23·0	1·7
58's	24·02	23·0 to 25·5	2·5
56's	26·65	25·5 to 29·0	3·5

* Micron = one-millionth of a metre, or $\frac{1}{25400}$ of an inch.

Number of Crimps as a Basis for Standardisation.

In addition to those on fibre thickness, standards based upon the number of crimps to the inch have also been established for each quality (see Table

2). Crimps are everywhere accepted as a ready guide in quality estimations, the understanding being that a close correlation exists between the number of crimps and the average fibre thickness of the wool. The greater the number of crimps the finer the wool. A comparison of a large series of samples has shown that the crimp standards of quality agree with the fibre thickness standards in about 75 per cent. of cases. They are not, however, reliable for wools from the neck and shoulder folds, nor from the fine wrinkles along the side of the body; also, they do not hold for wools grown when the sheep are in an impoverished condition, as from scarcity of food during drought. Fibre thickness is found to be the only certain guide to quality, and some woolmen are able to estimate this by hand examination without the aid of the crimps.

TABLE 2.—*Quality Range and Standard Range of Crimps for each Quality Number.*

Quality.	Quality Range of Crimps.	Standard Range.	Crimp Range.
150's	27–30	28–30	3
120's	24–27	25–27	3
100's	21–24	22–24	3
90's	19–21	(19) 20–21	(3) 2
80's	17–19	18–19	2
70's	15–17	16–17	2
66's	13–15	14–15	2
64's	11–13	12–13	2
60's	9–11	10–11	2
58's	7–9	8–9	2
56's	5–7	6–7	2

While fibre thickness is the main character concerned in quality estimations, it will be understood that the actual spinning power depends upon many other attributes of the wool, such as length, pliability, tensile strength, conformation and uniformity, and these are all taken into account in the selection of wools, as well as the yield. The standards given apply to raw wools only, and have no direct reference to spinning power, beyond what is implied by the buyer. In wool practice the term "quality" usually refers to fibre thickness only, as in the present instance, though some employ it to include other not well-defined characters.

The advantage of having fixed and definite measurable standards for all the characters influencing the spinning power is manifest, but up to the present fibre thickness is the only one in which a complete system has been evolved. If experience should ultimately lead to the adoption of the standards in practice it would be impossible to compare accurately one wool with another, that is, the different wools in the same fleece, the various wools from the same area and from areas with different conditions, and also wools from different countries. Woolmen could then buy to numerical specifications which can be measured, and spinners and manufacturers work to the same, while the breeder would have a better defined objective.

Exhibits of standard wools have been prepared in which the quality assigned to each is based upon the standard number of crimps and fibre thickness, and are extremely useful as a guide in quality estimations of other wools (Fig. 1).

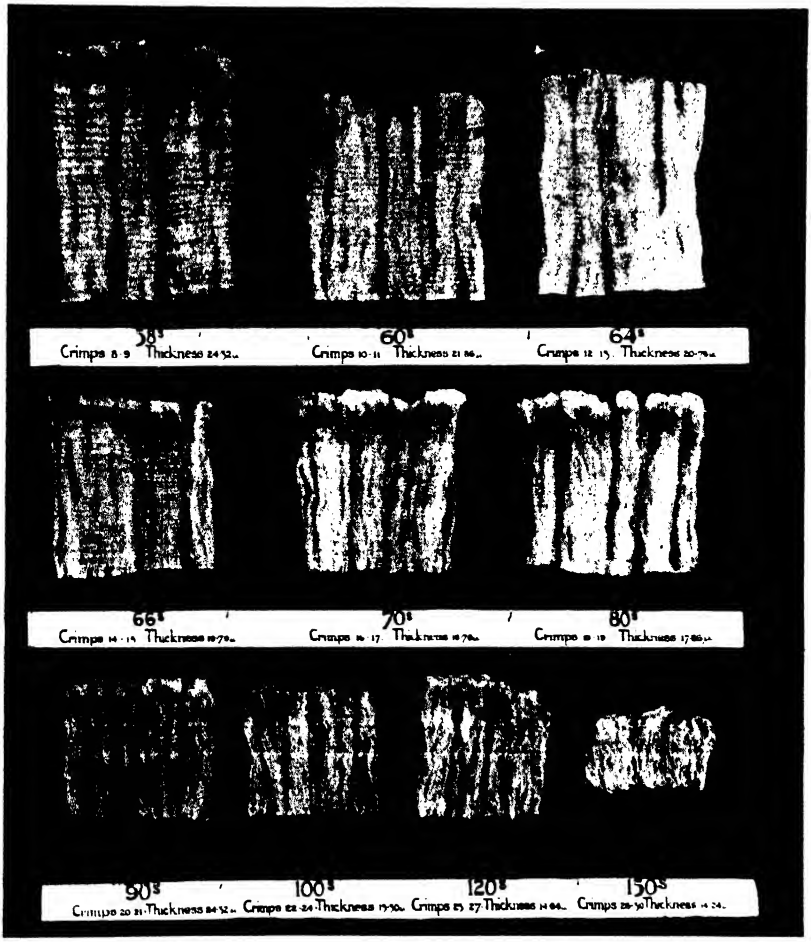

Fig. 1.—Set of Standard Wool Samples Classified According to Quality Number, Crimps per inch, and Fibre Thickness.

The standards given in the tables are based only upon South African wool practice, but an endeavour is now being made to compare them with the wool practice of other countries. The question may be asked, is a 70's South African wool of the same average thickness and crimpage as the corresponding quality from Australia, New Zealand, Argentina, and the United States; and similarly with the other qualities? If an agreement can be shown to exist some contribution will have been made towards a world standardisation of wool, so much to be desired.

Examination of Australian Wools.

Samples of Australian wools have been obtained from various sources, with their quality number assigned them by woolmen of experience. Recently a series of eleven varieties has been procured from Mr. E. A. Elliott, Sheep and Wool Expert, Department of Agriculture, Sydney, and have been studied in the same manner as the South African wools, with a view to comparing them with the standards. In each of the eleven qualities two different samples were included, and have been distinguished as Sample A and Sample B. That results are given below.

No. 1.—Australian 60's Merino.

Sample A: Crimps 8-9 = 58's; thickness 23.09 microns = 58's (60's).
Sample B: Crimps 9-10 = 60's; thickness 23.47 microns = 58's (60's).

The two wools included in the selection differ only slightly from each other as regards number of crimps and fibre thickness. Strictly they would be classified on thickness as 58's, but differ so little that for practical purposes they may be regarded as 60's, as would Sample B on its crimps; thus agreeing with the estimate.

No 2.—Australian 64's Merino.

Sample A: Crimps 11-12 = 64's; thickness 16.56 microns = 90's.
Sample B: Crimps 11-13 = 64's; thickness 20.53 microns = 64's.

On both crimps and thickness Sample B agrees with the South African standards for 64's.

The crimps in Sample A also agree, but the thickness measurement is the equivalent of a 90's. On testing the sample for soundness a weak zone is revealed about the middle of the length of the staples, across which they easily break, showing that the sheep had been impoverished either by drought or sickness, and the wool became tender and finer. On crimps therefore Sample A would be classed as a 64's, but on thickness it is a 90's, the difference being associated with a tenderness in the wool.

No 3.—Australian 66's Merino.

Sample A: Crimps 14-15 = 66's; thickness 17.61 microns = 80's.
Sample B: Crimps 16-17 = 70's; thickness 18.30 microns = 70's.

In Sample A the crimps would agree with the Australian estimate of the wool as a 66's, but the thickness is altogether anomalous, being the equivalent of an 80's. It is probable that the wool is either from the neck folds or side wrinkles, or has been grown under slightly impoverished conditions.

Sample B is more finely crimped than Sample A, though its fibres are thicker. On both its crimps and thickness it would, according to standards, be classed as a 70's, though the Australian estimate makes it a 66's.

No 4.—Australian 70's Merino.

Sample A: Crimps 16-18 = 70's; thickness 19.31 microns = 66's.
Sample B: Crimps 16-17 = 70's; thickness 17.31 microns = 80's.

The crimps in both samples would make the wool a 70's, which is in agreement with the Australian estimate. The thickness measurements,

however, show Sample A to be a 66's and Sample B an 80's; on testing for soundness both samples show a certain fibre weakness, which probably accounts for the discrepancy between the crimping and fibre thickness.

No. 5.—AUSTRALIAN 74's MERINO

Sample A: Crimps 18-19 = 80's; thickness 17.25 microns = 80's.
Sample B: Crimps 19-21 = 90's; thickness 15.40 microns = 100's.

The quality number 74's is not usually employed in South African wool practice, and Australian wools so numbered would be classed either as 70's or 80's. Thus Sample A would be an 80's according to both the crimp and thickness standards. Tests for soundness show Sample B to be a weak wool, and therefore finer than its general characters would indicate on hand examination alone.

No. 6—AUSTRALIAN 80's MERINO.

Sample A: Crimps 21-24 = 80's—100's; thickness 15.75 microns = 100's.
Sample B: *Lower half of staple*—Crimps 23-27 = 100's—120's; thickness 15.98 microns = 100's.
Upper half of staple—Crimps 19-22 = 90's—100's; thickness 19.70 microns = 66's.

It is not usual in practice to distinguish wools above 80's, though higher qualities exist and have been standardised as far as 150's, as shown in the tables. On hand examination alone these higher counts are difficult to separate, unless by comparison with standard samples, like those in Fig. 1.

Parts of Sample A given as an 80's would be classed as 100's, though others would be 90's and 80's. Sample B shows a break between the upper and lower halves of the staple. The lower half is a very fine wool on both its crimps and thickness, while the upper is fine on crimps, but on thickness represents a 66's. Wools of this nature are not infrequent, indicating that the one part of the fleece was grown under drought conditions, while the other was grown when food was more abundant, as after rains.

No. 7—AUSTRALIAN 100's MERINO.

Sample A: Crimps 18-22 = 80's—100's; thickness 18.78 microns = 70's.
Sample B: Crimps 22-26 = 100's—120's; thickness 18.72 microns = 70's.

The two samples are good illustrations of the irregularities between crimps and thickness in wools derived from the neck and shoulder folds. On crimps alone the wool along the ridge of a fold is usually classed as coarser than the fibre measurement proves it to be, while that in the depression between the folds shows a finer crimping than the thickness would suggest. Both samples have evidently been taken from between the folds, and while their crimping indicates a wool around 100's, the thickness measurements give only a 70's.

No. 8—AUSTRALIAN 58's COMEBACK.

Sample A: Crimps 8-9 = 58's; thickness 25.79 microns = 56's (58's).
Sample B: Crimps 8-9 = 58's; thickness 25.52 microns = 56's (58's).

On crimps the samples agree with the standard 58's, though on thickness they are slightly stronger, and would be strictly claimed as 56's, though approaching 58's.

Comeback and crossbred wools are not represented in South Africa, and few samples of Merino 56's and 58's have been available on which to base the relationship of the number of crimps and fibre thickness. It may well be that these types of Australian wools will give a slightly different relationship from that in the Table of Standards.

No. 9—Australian 60's Comeback.

Sample A: Crimps 11-13 = 64's; thickness 22.63 microns = 60's.
Sample B: Crimps 11-12 = 64's; thickness 21.42 microns = 60's.

According to crimps the samples agree with the standards for a 64's wool, but their thickness shows them as 60's, which is in agreement with the Australian estimate.

No. 10—Australian 58's Superfine Crossbred.

Sample A: Crimps 10-11 = 60's; thickness 25.38 microns = 58's.
Sample B: Crimps 10-11 = 60's; thickness 25.29 microns = 58's.

From the crimp standards the 58's superfine crossbred would be the equivalent of a 60's Merino; but its thickness measurements would, however, class it as a 58's Merino. The two samples differ but little in appearance and the separate measurements show a close approximation.

No. 11—Australian 56's Crossbred.

Sample A: Crimps 5-6 = 56's; thickness 27.66 microns = 56's.
Sample B: Crimps 7-8 = 56's (58's); thickness 26.82 microns = 56's.

The Australian estimate of the sample as a 56's agrees with the crimp and thickness standards for the same quality number of South African wools.

Close Agreement Between Australian and South African Standards.

The comparisons as a whole reveal a close agreement between the Australian estimates of quality and the standards for the corresponding quality based on South African wools, apart from the samples which have manifestly been grown under drought conditions or have been taken from the neck and shoulder folds. Small differences occur, but never of more than a single quality, and may with good reason be deemed to be incidental to the selection of the samples, presumably mostly on crimps. A closer agreement would doubtless be obtained if a larger selection of samples were available. It is, however, acceptable that the comparisons justify the general application of the standards to Australian wools.

For confirmations of this nature only sound, well-grown wools should be used, which have been shorn away from folds or wrinkles. Experience has shown that wools grown under drought conditions are finer, weaker, and more irregular than those grown under normal conditions, and that the

crimps are rarely in accord with the fibre thickness; the wools are usually finer than the crimping would indicate. In practice difficulty is experienced in estimating the true quality of droughty wools, but they always tend to

Fig. 2. Wool from a Strong Neck Fold (below) and from a Fine Side Wrinkle (above). The crimping in each case shows much variation.

fineness, and a whole season's clip may be affected in a prolonged and extensive drought. Fibre thickness, not crimps, then becomes the true criterion of quality. When tested for soundness droughty wools usually break at one part or another of the staple, and this is shown to be the condition

in several of the present samples. Sometimes, as in the case of No. 6 (Sample B), the one half of the staple may be quite different in thickness from the other, the upper finer half having been grown during drought and the lower thicker half after rains.

Further, crimps are no certain guide to quality in wools from the neck and shoulder folds, nor for wools from the finer wrinkles which are often present along the sides. From the manner of their formation crimps are usually best defined and most regular and reliable in the even compact wools over the smooth surface of the body. Along the ridge of a fold the crimps may suggest a wool of 58's or 60's, while the thickness measurement would indicate a wool of 66's or 70's; on the other hand, as seen in the sample of No. 7, the crimps in the wool from the depression between the folds may indicate a wool of 100's and the thickness show it to be a 70's. On account of its coarseness and irregular character, the wool from the apron (the runner) is usually removed in skirting when classing for quality; also in careful breeding efforts are made to correct the unevenness.

Due allowance being made for these well-established irregularities in the samples selected, the Australian quality estimates are in close agreement with the standards founded upon the corresponding South African qualities. Hence from the results and others which are available, there is every reason to hold that the quality estimations of Australian wools agree with those of South Africa, and that the standards proposed will serve for both countries.

In conclusion, the writer desires to express his highest appreciation of the kindness of Mr. E. A. Elliott in supplying the samples for the study.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1930.

Dapto	Jan.	10, 11
Albion Park	,,	17, 18
Coff's Harbour (J. Walters) ...	,,	25, 27
Kiama	,,	25, 27
Berry	,,	31, Feb. 1
Coramba	Feb.	4, 5
Bowraville	,,	4, 5
Wollongong (W. J. Cochrane)...	,,	6, 7, 8
Tahmoor...	,,	7, 8
Leeton (W. Roseward)	,,	11, 12
Macksville	,,	11, 12
Wauchope	,,	13, 14
Castle Hill	,,	14, 15
Stroud	,,	14, 15
Milton	,,	19, 20
Blacktown	,,	21, 22
Wyong	,,	21, 22
Bulladelah	,,	21, 22
Pambula (L. K. Longhurst) ...	,,	21, 22
Newcastle (P. Leegoe)	,,	25, 28, Mar. 1
Uralla (D. G. Evans)	,,	26, 27
Oberon (F. H. Kelly)	,,	27, 28
Gunning (G. E. Ardill)	Feb.	27, 28, Mar. 1
Penrith	,,	28, Mar. 1
Robertson	,,	28, Mar. 1
Bowraville (A. H. Newman) ...	Mar.	4, 5
Braidwood (R. L. Irwin) ...	,,	5, 6
Maitland (M. A. Brown) ...	,,	5 to 8
Wallamba (E. A. Carey) ...	,,	6, 7
Rydal (H. Murray)	,,	7, 8
Gundagai (P. J. Sullivan) ...	,,	11, 12
Dorrigo (J. H. Skeoch)	,,	12, 13
Bellingen...	,,	18, 19
Bombala (P. J. Jonas)	,,	19, 20
Batlow (C. S. Gregory)... ...	,,	25, 26
Kempsey (E. Mitchell)	,,	26, 27, 28
Gresford (A. R. Brown) ...	,,	28, 29
Dungog (W. H. Green)	April	2 to 4
Camden (G. V. Sidman) ...	,,	3, 4, 5
Sydney Royal (G. C. Somerville)	,,	15 to 26
Orange (G. L. Williams) ...	May	6, 7, 8
Grafton (L. C. Lawson)... ...	,,	7 to 10
Casino	,,	13, 15
Wagga (F. H. Croaker)	Aug.	26, 27, 28
Junee (G. W. Scrivener) ...	Sept.	2, 3

Oils Suitable as Vehicles for Sheep Blowfly Dressings.

TRIALS AT NYNGAN EXPERIMENT FARM.

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THOUGH many types of dressings are commonly used for the treatment of cutaneous myiasis of sheep (caused by infestation with sheep blowfly maggots), oily dressings are probably the most common, as oil possesses two valuable properties—it penetrates the wool well, and it persists there.

The object of the experiment described in the following pages was to test various oils, both alone and with the addition of colouring matters, by applying them to the wool and skin of sheep to determine their penetrating value, adhesiveness, and durability in the wool, with the object of determining the most suitable base for a blowfly dressing. Four tests were carried out.

THE FIRST TEST.

In the first test the following oils were tried:—(1) Fish oil; (2) whale oil; (3) boiled linseed oil; (4) resin oil; (5) shale oil; (6) cottonseed oil; (7) liquid petroleum; (8) olive oil; (9) light pale mineral oil.

The sheep chosen for this test were weaner ewes (P flock), all of a fairly even type—with plain bodies, crutch devoid of wrinkles, and the wool strong and open. Three areas were selected on each sheep for the application of the oils—one on the middle of the back and one on each side of the crutch—and the sheep were prepared by shearing the wool off to a length of about ¼ to ½ inch over a circular patch about 4 inches in diameter.

The oils were each divided into three lots of 4 oz. each. To one lot ½ gramme of iodine was added, to another ½ gramme of vegetable black, and the third was used in its pure state. The colouring matters, iodine and vegetable black, were thoroughly incorporated in the oils and were used to test the adhesiveness and persistency in the wool. The addition of the iodine to the oils did not give good results. In the clear, colourless oils such as liquid paraffin, it produced a purplish colour, whereas with the finer oils, e.g., light pale mineral oil, a brownish colour was produced; in the thicker oils it had little effect, only giving a light-brownish tint. The vegetable black mixed well with all the oils, giving consistent black colouring throughout.

* Sheep blowfly investigations are carried out under the aegis of the External Parasites of Sheep Committee of the New South Wales Department of Agriculture, and Mr. Mulhearn's investigations at Nyngan Experiment Farm have been directed by Dr. H. R. Seddon, Director of Veterinary Research.

On each sheep, the uncoloured oil was applied to the area on the middle of the back, the oil with vegetable black on the left side of the crutch, and the oil with iodine on the right side of the crutch. In every case the oil was rubbed well through the wool into the skin over a circular area about 3 inches in diameter.

The oils were applied in this experiment on 8th March, 1928, and the sheep were then examined at fortnightly intervals. The following are the particulars of the results from the individual oils:—

Fish Oil.—This oil when applied penetrates and diffuses through the wool fairly well. It remains in the wool very well, particularly so in the longer wool on the back and side of the ribs, to where it runs from the back. It also adheres very well on the crutch, where it is inclined to run down from the dressed area to the longer wool below. In all situations a fishy smell was quite noticeable six weeks after application.

The colour from the vegetable black remains well in the wool and diffuses right over the skin, but the colour from the iodine, never very noticeable, soon disappears, even though the oil is still present in the wool. At the first inspection after application the skin of the back was slightly thickened and irritated and this condition persisted at a subsequent examination, though the skin on either side of the crutch remained normal throughout the trial.

Whale Oil.—Whale oil penetrates and diffuses through the wool moderately well. It remains in, and adheres very well to the wool on the back, and in this respect compares most favourably with any of the other oils, but it does not appear to adhere so well on the crutch.

The colour produced with iodine is not very noticeable nor persistent and it soon disappears from the wool. The colour from the vegetable black adheres better and it persists in the wool as a greyish black even after all traces of the oil are gone. With this oil there is no damage to the skin on either the back or the crutch.

Boiled Linseed Oil.—This oil does not penetrate or run well through the wool, which becomes badly matted, both on the back and both sides of the crutch. The oil is present only in small quantities in the matted wool.

Resin Oil.—Does not penetrate well and it mats the wool badly on the back and on both sides of the crutch. Only small quantities of thick oil are present in the matted wool. It is inclined to thicken the skin.

Shale Oil.—Shale oil penetrates and diffuses exceedingly well through the wool—it was the best oil used as far as this property is concerned. Very little oil remains in the wool, either on the back or the crutch, and the colour does not remain very well. The action of this oil on the skin is much too severe, as it causes the formation of a crust on, and a thickening of, the skin over the treated area. This skin when wrinkled up cracks and is painful to the sheep. The wool later lifts off the dressed area.

Cottonseed Oil.—Cottonseed oil does not penetrate or diffuse through the wool very well. In places on the back, the wool appears to have formed into soft clusters where the oil remains fairly abundantly. The oil adheres fairly well on the crutch, where it is inclined to be sticky and in clusters. The colour from the vegetable black remains very well in the wool, particularly in the clusters, but the iodine colouring is not very noticeable and soon disappears. This oil does not damage or irritate the skin.

Liquid Petroleum (Paraffinum liquidum).—Liquid petroleum penetrates and diffuses through the wool fairly well, but it does not adhere to, nor does it persist in, the wool. It disappears and there is no trace of it in a comparatively short time. Neither the iodine nor the vegetable black colour remains very well on the crutch, but soon disappears, particularly the former. There is no irritation or damage to the skin.

Olive Oil.—Olive oil penetrates and diffuses through to the skin moderately well. It remains in the wool very well—particularly on the back where the wool was still very oily six weeks after application. It also remains very well in the crutch wool, but it is inclined to run off into the longer wool below the treated area. The vegetable black colouring matter is present in the wool for a considerable time after dressing, and is well diffused right through the skin. The iodine colouring, as in all other cases, soon disappears, even though the oil is still abundant in the wool. There is no damage or irritation to the skin with this oil.

Light Pale Mineral Oil.—This oil penetrates and diffuses through the wool very well and goes right to the skin. It does not remain in, nor adhere to, the wool very well, and it is nearly all gone in four to five weeks both on the back and in the crutch. The vegetable black colouring matter is consistent through the wool, but there is no oil. Iodine colour soon disappears, as also does the oil.

The action of light pale mineral oil on the skin of both crutch and back is very severe—particularly so on the back. It causes a crust formation over, and a thickening of, the skin, which cracks when wrinkled, causing much pain to the sheep. Later the wool lifts off leaving a bare patch. Though this action is much more severe on the back than the crutch, it is noticeable also in the latter situation.

Conclusions on the First Test.

From the test, the oils can be classified as follows:—

Penetration and Diffusion.—

(*a*) Oils which penetrate and diffuse through the wool very well—shale oil; light pale mineral oil.

(*b*) Oils which penetrate and diffuse through the wool moderately well—fish oil; whale oil; olive oil; liquid petroleum.

(*c*) Oils which do not penetrate or diffuse through the wool too well—boiled linseed oil; cottonseed oil.

Durability.—

(*a*) Durable oils on both back and crutch—fish oil; olive oil; cottonseed oil.
(*b*) Durable oils on back, not so durable on the crutch—whale oil.
(*c*) Non-durable oils—liquid petroleum; shale oil; light pale mineral oil; boiled linseed oil; resin oil.

Effect on Wool.—

(*a*) Oils which mat the wool badly—resin oil; boiled linseed oil.
(*b*) Oils which are inclined to mat the wool and form it into soft clusters—cottonseed oil.

Skin Irritation.—

(*a*) Oils which are irritant to both back and crutch—light, pale mineral oil; shale oil.
(*b*) Oils which are slightly irritant to the back only—fish oil; resin oil.
(*c*) Non-irritant oils—olive oil; whale oil; cottonseed oil; liquid petroleum; boiled linseed oil.

The best oils are therefore olive oil, whale oil, and fish oil. Whale oil has the disadvantage that is not so durable on the crutch as the other two, and fish oil that it is slightly irritant to the skin of the back.

THE SECOND TEST.

The second test in which four different grades of mineral oil were used, was carried out in the same manner as the first, the same amounts of oils and colouring matters being used and applied in the same situations. The oils used were:— (1) pale mineral oil A (a heavy oil); (2) pale mineral oil B (a medium oil); (3) pale mineral oil C (a light oil); (4) light pale mineral oil D (much the same as (3) and the same as that used in the first test).

The oils were applied on the 3rd April, 1928, and further examinations were made on 16th and 30th April, 1928.

Pale Mineral Oil A.—This oil penetrates through the wool to the skin moderately well. The durability is moderate to good, better on the back than the crutch. The black colour remains only fairly well after the oil disappears (about three to four weeks after application), and the iodine colour disappears early—before the oil.

The wool is inclined to form into clusters where the oil is most prominent. There was moderate irritation to, and a thickening of, the skin, and the wool was lifting slightly after about four weeks.

Pale Mineral Oil B.—This oil penetrates through the wool to the skin fairly well. Its adhesiveness and durability are quite good, both on the back and the crutch, but more so on the former than the latter. The vegetable black colour adheres well on the crutch with the oil, but the iodine colour soon disappeared.

There was also a moderate irritation and thickening of the skin with this oil, as with pale mineral oil A.

Pale Mineral Oil C.—This oil penetrates through the wool to the skin, and its durability in the wool is only fair.

It must be condemned on account of its irritant action to the skin of the sheep. Shortly after application it causes a crust formation over the skin of the back and the crutch with, later, a hardening and thickening. The cracks become numerous when the skin is wrinkled up, being a source of irritation to the sheep; later the wool lifts off the area on the back. This irritant action is much more severe and pronounced on the back than the crutch. This is probably due to the fact that the oil runs off the crutch, whereas it remains on the skin of the back. The fact that the back is exposed to, and the crutch is protected from, the sun may be another reason.

Light Pale Mineral Oil D.—The action of this oil is much the same as that of pale mineral oil C.

Conclusions on the Second Test.

The oils can be grouped as follows:—

Skin Irritation.—

(*a*) Very irritant oils—C and D.
(*b*) Moderately or slightly irritant oils—A and B.

Durability.—

(*a*) Moderately durable oils—A and B.
(*b*) Non-durable oils—C and D.

The pale mineral oils A and B are thus the best oils from this group, but as both are irritant to the skin of the sheep they are not suitable oils.

The dressing in use with light pale mineral oil D as a base has been giving good results as a healing agent to the wounds of struck sheep. This dressing is not rubbed into the skin as much as the oils under test were; this would partly explain why the irritant action observed in this experiment was not so noticeable, if present in the struck sheep. Again, the struck areas are usually round the crutch, and if the wool has not been removed by the action of the strike it is usually nearly all removed with the shears, so that the oil is not retained in the same quantities as it is when the wool is longer, as in the experiment.

THE THIRD TEST.

The following oils and mixtures were used in a third test:—(1) Fish oil; (2) herring oil; (3) whale oil; (4) peanut oil; (5) cottonseed oil; (6) castor oil and kerosene (equal parts); (7) soybean oil; (8) pale mineral oil C; (9) colza oil; (10) raw linseed oil (three parts) and kerosene (one part).

In this test two 2 oz. lots of each of the oils were measured out, and in one lot of each ½ gramme of vegetable black was thoroughly incorporated. The oils were then applied and well rubbed into the wool and skin of the sheep in two situations, the middle of the back being used for the pure oil and the right side of the crutch for the oil containing the vegetable black. These situations were prepared by removing portion of the wool over the areas so that about ¼ to ½ inch length of wool remained. The oil was applied on the 21st September, and the sheep were examined at weekly intervals.

Fish Oil.—This oil diffuses and penetrates very well through the wool taking the colour right to the skin. It turns the wool a brownish-yellow colour on the back, particularly near the base, and forms a slight crust over the skin which appears to be tender for a few weeks. There is no thickening of the skin. The oil adheres very well to the wool on the back and was still very plentiful one month after application. It also holds moderately well on the wool of the crutch, particularly low down where it has run into the longer wool.

Herring Oil.—This oil penetrates and diffuses through the wool fairly well, going right down to the skin. It causes a brownish yellow colouration in the wool of the back with the formation of a light brown crust over the skin. The skin on back appeared to be a little sore on manipulation for some time after application of the oil.

The oil remains in the wool of the back very well, but it soon leaves the dressed area on the crutch, running down into the longer wool where it remains very well.

Whale Oil.—This oil is good for penetration of the wool, going right into the skin. On the back it causes a yellowish colour through the wool with a slight brown crust near the skin, but not so bad as fish oils. In the test the skin at times appeared to be very slightly sore on manipulation. The adhesive powers of this oil were particularly good on the back, giving the best results of all; a month after dressing the oil was quite thick in the wool right down to its base. On the crutch it did not last nearly so well, and most of it had gone from the dressed area after a few weeks, though some remained in the longer wool for a while.

Peanut Oil.—Peanut oil penetrates through to the skin very well and is a little sticky in the wool. The skin appears to be little thickened, and a fairly definite crust forms right over the dressed area on back. The skin was sore on manipulation. The oil adheres to, and remains well in the wool of the back area, but as the wool grows it does not run down to the skin. The results on the crutch are not very good; there were only traces of oil below the area to which it was applied.

Cottonseed Oil.—This, being a thicker oil does not penetrate through the wool as well as some others, but in the test it penetrated fairly well, leaving a deposit of vegetable black right on the skin. It remained moderately well in the wool of the back, but it is sticky and inclined to mat the wool. A slight crust was formed over the skin, which appeared to be a little tender on manipulation.

On the crutch the oil remains well in tips of the wool in thick sticky patches; the vegetable black colour is quite good and adheres well to the wool. The wool is inclined to be matted.

Kerosene and Castor Oil (equal parts).—This mixture penetrates fairly well, going right to the base of the wool, but it considerably hardens and irritates the skin on the back and crutch of the sheep, later causing the wool to lift. There is a slight matting of the wool. This mixture is much too severe.

Soybean Oil.—This oil penetrates fairly well, but does not last well in the wool. It hardens and forms a crust over the skin, which later cracks and causes considerable irritation. It is too severe on the skin of the sheep.

Pale Mineral Oil C.—This oil penetrates well, adheres moderately well, but it is much too severe on the skin of sheep both back and crutch. It was the most irritating of all tried in this test.

Colza Oil.—This oil penetrates and adheres well, but forms hard crusts over the skin, which it hardens, thickens and cracks, causing the wool to lift. Much too severe on the skin.

Raw Linseed Oil and Kerosene (3 : 1).—This mixture penetrates fairly well, but the oil dries out very quickly leaving dry hard mats of wool.

Conclusions on the Third Test.

From this test, the oils may be grouped as follows:—

Penetration.—

(*a*) Oils which penetrate well—fish oil; herring oil; whale oil; peanut oil; kerosene and castor oil (equal parts); and pale mineral oil C.

(*b*) Oils which penetrate fairly well—colza oil; raw linseed oil and kerosene (3 to 1); soybean oil; cottonseed oil.

Durability.—

(*a*) Durable oils on the back and crutch—fish oil; herring oil; cottonseed oil.

(*b*) Durable on the back, not so good on the crutch—whale oil; peanut oil.

Effect on the Wool.—

(*a*) Oils which mat the wool badly—raw linseed and kerosene (3 to 1).

(*b*) Oils which mat the wool slightly—cottonseed oil.

Skin Irritation.—

(*a*) Oils which are irritant to the skin of the back and the crutch—pale mineral oil C.; kerosene and castor oil (equal parts); colza oil.

(*b*) Oils which are irritant to the back only—soybean oil (badly); peanut oil; fish oil and herring oil (mildly); whale oil and cottonseed oil (very mildly).

The best oils are therefore whale oil, fish oil, herring oil, and cottonseed oil. Whale oil is only very slightly irritant, but it is not quite so durable on the crutch as fish or herring oils, though it is equally so or better on the backs. Fish and herring oils have the disadvantage of being slightly irritant to the skin on the backs of sheep.

THE FOURTH TEST.

The fourth test was carried out in the same manner as the third—only two lots of oil being applied to each sheep. The oils and mixture used were:—(1) wood oil; (2) neatsfoot oil; (3) cottonseed oil (85 per cent.) and kerosene (15 per cent.)

Wood Oil.—This oil penetrates very well, going right to the skin, and as the wool grows it is not carried away, but remains on the skin. Its durability and adhesiveness are very good both on the back and crutch.

Its action on the skin of the back is much too severe—it causes thickening and hardening of the skin, which cracks, and, later, lifting of the wool. Its action on the skin of the crutch is satisfactory.

Neatsfoot Oil.—This oil penetrates moderately well, both on the back and the crutch. It goes right down to the base of the wool and holds the colour (vegetable black) woll. Its durability is quite good on the back, but on the crutch it is inclined to run from the treated area to the longer wool below, where it remains quite well.

There is little or no damage to the skin of the back or crutch.

Cottonseed Oil (85 *per cent.*) *and Kerosene* (15 *per cent.*).—The addition of the kerosene to the cottonseed oil adds greatly to its penetrating and diffusing powers, and it goes right down to the skin very well. Later, the kerosene seems to disappear and leave a very sticky oil substance on the wool. Its durability in the wool of the back is fair, but it forms into sticky clusters, and grows away from the skin with the new wool. This is more noticeable on the crutch.

The oil causes a slight crust with a little thickening and soreness of the skin of the back.

Conclusions on Fourth Test.

These oils may be grouped as follows:—

(*a*) Irritant oils—wood oil; cottonseed oil (85 per cent.) and kerosene (15 per cent.)—slightly.

(*b*) Non-irritant oils—neatsfoot.

Durability.—

(*a*) Moderately durable oils—neatsfoot oil; wood oil (especially so on crutch.)

The most suitable oil from this group would be neatsfoot oil. Wood oil would be very suitable only for the fact that it is too irritating on the back.

GENERAL CONCLUSIONS.

From this series of tests, the oils which have proved to be most suitable are olive oil, fish oil, herring oil, whale oil, neatsfoot oil and cottonseed oil.

Olive oil is too expensive to be used on a large scale and so must be discarded.

Fish oil, herring oil and whale oil are about of equal value. Fish oil and herring oil have the disadvantage of being slightly irritant to the skin of the back, though they showed no sign of irritation on the crutch. Whale oil may be only very slightly irritant to the skin of the back, and although it gives better results as a durable and persisting oil on the back it does not give such good results on the crutch as fish or herring oils.

Neatsfoot oil is quite a suitable oil, but it does not penetrate so well, nor is it quite so durable as the above oils.

Cottonseed oil is next, but being a thicker oil, it does not penetrate so well nor is it quite so durable as the oils mentioned above.

Of the remaining oils, none is very suitable as a base for a fly dressing, each having some serious disadvantage. The mineral oils, generally, and particularly the finer ones, are too irritating and severe on the skin of the sheep, whereas the thicker oils cause matting of the wool.

In all cases it has been an outstanding feature that where there has been irritation, it has been more severe on the back than the crutch, whilst in some cases although there was a severe irritation on the back, the skin of the crutch remained normal.

Similarly the oils have been more persistent and durable on the back than on the crutch. This is probably explained by the fact that the oils are not able to escape so easily from the back as from the crutch.

Bathurst Burr Seeds Attacked by Insects.

This interesting discovery has been recorded by the Senior Assistant Entomologist of the Department (Mr. T. McCarthy), who succeeded in breeding out a number of small flies belonging to the family Trypetidae. That some insect was attacking the seeds of Bathurst burr in the Forbes district was first reported by Mr. R. Gibbes, of North-west Ooma, *via* Forbes, and by arrangement with Mr. McCarthy he forwarded several lots of seeds from that locality for observation. Many flies were bred out and a number were later forwarded by the Entomologist to the British Museum for identification. Word has now been received from the Dipterologist (Mr. F. W. Edwards) that the fly has been identified as *Camaromyia bullans* Wied., a species not previously represented in the British Museum collections. Mr. Edwards states that the fly occurs in southern Europe and South America, but that its life history was, prior to this record, unknown. Further details with illustrations of the fly will be published later in the *Agricultural Gazette.*

The Effect of Young, Immature St. John's Wort on Sheep.

H. R. SEDDON, D.V.Sc., and H. G. BELSCHNER, B V.Sc.*

IT is a well-established fact that the ingestion of the well-grown or flowering plant of St. John's Wort (*Hypericum perforatum*) by stock leads to photosensitisation and consequent dermatitis of the unpigmented portions of the skin.

The effect of St. John's Wort is recorded by Cornevin (quoted by Lander[1]), who noted that in Europe mild symptoms of dermatitis might occur, and by Summers[2] in South Australia, who reported that it was said to cause horses which eat it to break out in sores. The essential feature of the action of the sun's rays seems to have been first appreciated by Rogers[3], who investigated the effect of the plant in 1914. This was confirmed by Dodd[4] in this State in 1920, and also by Henry[5] in 1922, who showed by experiments in which the stock were muzzled that mere contact with the plant did not induce symptoms. We do not know with what state of the plant Rogers worked, but Dodd used the plant when it was in flower and Henry in the stage immediately preceding flowering.

The question of whether the plant is harmful when in a more immature stage is of some practical importance, for it has been suggested that a possible means of control of the pest would be to graze it when young by sheep or cattle.

Field Investigations.

To determine the point, field investigations were made by one of us (H.G.B.) in the Mudgee district. Several farms, where the plant is growing abundantly, were visited. On the property of Mr. R. a mob of fifty mixed sheep were seen grazing on a 10 to 15 acre paddock heavily infested with St. John's Wort in a young stage of growth, and it was estimated that at least 50 per cent. of the available food consisted of the weed. This was a cultivation paddock, and the sheep had been turned in to eat it down before ploughing commenced. The sheep had been in the paddock about ten days, and had previously come off St. John's Wort country. A big percentage of the sheep were exhibiting the typical dermatitis on the nose, face and ears. The whole of this farm is more or less infested with the plant, and walking over the paddocks, which had been heavily stocked, the young plant was observed everywhere amongst the grass.

In conversation, the owner, who has had a number of years' experience with the plant in the Mudgee district, stated that the young growth of the weed is just as dangerous, if not more so, than the old growth, probably

* A research undertaken under the Poison Plants Committee of the Commonwealth Council for Scientific and Industrial Research.

because sheep eat more of the plant in the young stage. Stock are always inclined to eat the grass and other herbage before commencing on the St. John's Wort, but will eat the young growth quite readily if there is no grass. The owner was also of the opinion that some sheep eat more of the plant than others do.

A point this owner had noticed particularly was the association of weather conditions with the production of symptoms in sheep, but he stated that though sheep were affected more particularly in the summer time, they became affected at all periods of the year. He well remembered during the summer of a few years ago when a whole mob of lambs was badly affected, with the exception of a black lamb. He stated that the animals were in a pitiable condition.

The property of another owner was visited, and sheep were found to be affected there. The plant was well distributed all over this farm, and the owner stated that it was impossible to control the pest. It was getting worse every year in spite of cultivation and grazing.

As the result of these investigations one of us (H.G.B.) formed the opinion:—

(*a*) That there is undoubted evidence that the plant is harmful even in young stages of growth; and also

(*b*) that grazing the plant when young gives a certain measure of control, but will never eradicate the plant.

Sheep may be left on the plant for a time and will eat a great deal of it off, but when symptoms become severe it is necessary to remove them. Even the repeated changing of the stock would not be likely to eradicate the plant, for its very nature, as exhibited by its deep rooting system and the statement that if the smallest portion is left in the ground it will shoot again, is against close grazing being to any great extent a method of control, and certainly it will never eradicate it.

Laboratory Investigations.

In order to determine, by actual feeding experiments, the effect of the young immature plant, supplies were forwarded regularly to Glenfield. The plants used were all immature and from 6 to 10 inches high. They were tested by feeding to sheep, when it was found that ingestion set up the usual type of dermatitis, from photosensitisation, seen in sheep. The symptoms were somewhat delayed in onset, and certainly were not as intense as one has seen in cases induced experimentally in summer, but such, in our opinion, is due largely to the lessened intensity of sunshine during early winter months (when the tests were conducted).

In summer we have found that in bright warm sunny weather symptoms are induced more readily than when dull, cool, moderately cloudy days occur. During the tests in question the days were sunny for the most part, but lacked the warm sun of summer. Even so, symptoms were noted to be more marked about 2 p.m. on the brighter, sunnier, warmer days.

In the absence, as yet, of a definite method of determining the sensitising properties of the plant (*e.g.*, chemical examination for photosensitising principle), one cannot be positive upon this point, and it is only right here to note that, feeding similar quantities (in summer) of immature and of mature plant, there seems definite evidence that the mature plant is the more harmful. We may state, however, that using the dried mature plant, we have found that, on testing it at different periods of the year, more serious effects are manifested in summer than in winter.

One concludes, therefore, that even the young plant is harmful.

Conclusion.

From the above it will be seen that, owing to the harmful effects of the plant even in the young stages of growth, stock cannot be depastured upon it continually. Heavy stocking with sheep, moving them after a week or ten days, exerts a certain measure of control, but involves much trouble and inconvenience, and will not accomplish the eradication of the plant. It does not seem that it is a practicable procedure in a district where bright sunny days are common in the winter. Possibly in a district where the climate is less favourable for the production of dermatitis, *i.e.*, where cloudy winter days are the rule, a greater measure of success might be attained.

Animals with entirely pigmented skins are certainly insensitive to the action of the plant, but the degree to which they would contribute to the control of the plant, and the risks from such heavy stocking as would be necessary, do not seem to warrant their employment.

REFERENCES CITED.

1 CORNEVIN.—Quoted by Lander, " Veterinary Toxicology," London.
2 SUMMERS.—*Jour. of Agric.*, South Australia, 1911, p. 144.
3 ROGERS.—*American Veterinary Review*, November, 1914.
4 DODD.—*Agric. Gaz. of N.S.W.*, Vol. 31, 1920, p. 265.
5 HENRY.—Ibid., Vol. 33, 1922, p. 205.

"THE CROP GROWER'S COMPANION."

"THE Wohler process of electrifying seeds received a good deal of attention a few years ago, but the results at Rothamsted and at Messrs. Suttons, Reading, do not appear to have been very encouraging."

The above is a passage taken from one of the most recent English books on agriculture—*The Crop Grower's Companion*, by John Porter, B.Sc., N.D.A., N.D.D.—and confirms the results of experiments carried out by the New South Wales Department of Agriculture.

Our copy of *The Crop Grower's Companion* was received from the publishers, Messrs. Gurney and Jackson, London. The Australian reader will be more interested in the theoretical than the practical side—which is essentially English—of this book. A section of the work is devoted to farm calculations and handy tables.

Anthrax.

H. G. BELSCHNER, B.V.Sc., District Veterinary Officer (West).

ANTHRAX is an acute infectious disease caused by a specific organism, the anthrax bacillus, gaining entrance to the body. Sheep and cattle are the animals usually attacked, but any domesticated animal, and also man, is susceptible to the disease. The order of susceptibility is somewhat as follows:—Sheep, cattle, horses, and man. Considerably less susceptible are pigs, dogs and cats. Fowls are practically immune.

Anthrax is said to have been introduced into Australia about 1847, and it has at times been responsible for very heavy losses, particularly among sheep, in this State. At the present time, thanks largely to the method of vaccination which was first worked out by Pasteur, it is of rarer occurrence.

In New South Wales, the disease is curiously localised, and the area in which infection from anthrax may be expected or feared is limited. Occasionally outbreaks occur in other parts.

Methods of Infection.

Sheep and cattle generally contract the disease in this country through feeding over contaminated ground, and swallowing the spores of the anthrax bacilli with their food. These spores, which might be likened to the seeds of plants, are formed from the bacilli when infected blood is exposed to the air. This is important to remember, as it has a great bearing on the control of the disease. These spores are very resistant to heat and dryness, and they retain their vitality for many years. When swallowed by the sheep, and on reaching the blood stream, the spore breaks and a bacillus is formed, which immediately commences, multiplying by elongating and then dividing in two, each organism continuing the process indefinitely. Multiplication takes place so rapidly that in from six to eight hours time several million organisms have been formed. Death takes place from the rapidly increasing number of organisms in the blood stream, or from the toxins produced by the organisms which poison the body.

Infection can also take place through scratches and other wounds of the skin, mouth, or tongue.

Pigs and dogs usually get anthrax from eating the flesh of animals that have died of the disease.

Humans contract the disease usually through wounds in the skin when handling anthrax carcases. "Wool-sorter's" disease is anthrax contracted by inhaling dust laden with anthrax spores.

Method of Spread of the Disease.

It has been stated above that spores are formed from the organism when the blood is exposed to the air. After the death of an animal, the organisms cease to multiply, and spores cannot be formed unless the organisms are exposed to the air, hence they die in the carcase. If, however, the carcase is cut into, say, for the purpose of making a post-mortem examination, millions of organisms are exposed to the oxygen of the air, and spore formation takes place. Apart, therefore, from the personal risk, the carcase of any animal suspected to have died of anthrax should never be opened or skinned. Wild pigs and dogs may spread the disease by eating a diseased animal. The spores may be washed away by rain, blown by the wind, or carried in the wool of healthy sheep to other parts and so infect the pasture.

Seasonal Incidence of the Disease.

A review of the records of anthrax in New South Wales shows that the seasonal incidence is very marked, namely, from October to March. Anthrax may, of course, occur at any time of the year, but the period of maximum danger is during the summer and early autumn. The reason for this has not yet been definitely determined, but it is significant that many outbreaks of anthrax coincide with the seeding of the grasses. Sometimes the disease is prone to occur after summer rain, and this may be due to new growth of grasses and herbage, the young plants bringing the organisms out of the soil, or from the sheep eating close to the ground to obtain the young plants.

Symptoms.

Symptoms of the disease are not often observed in sheep. Most cases are found dead without obvious cause, but some may show such premonitory symptoms as high fever, suspension of rumination and feeding, dullness and general weakness. Generally, a sheep that to all external appearances is in normal health drops down and dies in convulsions.

Cattle also die very quickly without showing many symptoms, but horses are usually affected in a more sub-acute form, and may exhibit symptoms of sickness for several days before death takes place. The symptoms exhibited by the horse are high fever, general depression, and the animal refusing to eat. In addition, symptoms common to other diseases are likely to occur, but a fairly characteristic symptom in horses is the presence of acute oedematous swellings on different parts of the body, but especially under the chest and along the abdomen. These swellings are fairly characteristic.

In the pig, the most characteristic symptom is a swelling of the throat. The swelling may extend from the neck to the head, and cause great difficulty in breathing and swallowing. Affected pigs also show fever, and seek the shade or lie in corners of the yard.

Diagnosis.

Sheep found dead in the paddock usually exhibit a dark blood stained discharge from the nostrils and anus, and as putrefaction takes place very rapidly in an anthrax carcase, the abdomen is usually very much distended with gas. If inadvertently the carcase were opened, and a post-mortem examination made, the blood would be found to be dark and tarry, and disinclined to clot. The spleen is usually very much enlarged, soft and dark, and parts of the intestine may be much congested and thickened.

The only certain way of diagnosing the disease is by the microscopic examination of blood smears taken soon after the death of the animal. A blood smear or an ear packed in a tin should, therefore, be forwarded for examination.

Whenever the disease is suspected, the Inspector of Stock for the district should be notified immediately, as anthrax is a notifiable disease under the Stock Diseases Act, 1923.

Control.

Owing to the rapid nature of the disease, treatment in animals is useless. Protective vaccination is, however, carried out immediately the disease breaks out in a flock or herd. All animals that have been in contact, or those likely to be subjected to the risk of contracting anthrax, should be vaccinated. There are now a number of reliable vaccines on the market. Only a licensed inoculator is allowed to vaccinate animals with anthrax vaccine. Other methods for prevention of the spread of the disease have already been referred to.

The greatest source of spread of the disease is the anthrax-infected carcase, hence all carcases of animals which have died of the disease should be disposed of by burning, for preference, on the spot, or by burial to a depth of at least 6 feet. Although this may entail a considerable amount of work and expense, it is essential that it be carried out. If the carcase has to be moved, chloride of lime, or a thick layer of unslaked lime should be placed over the ground along which the carcase has been moved.

Finally, every possible care should be taken to see that an anthrax-infected carcase is not skinned or cut into, as this is the commonest means of spreading infection.

The Value of Meat as an Article of Diet.

The extraordinary nutritive qualities of meat, unrivalled by any foodstuff of plant origin, are due partly to the great variety of plants and plant products used by the animal for the building up and maintenance of its body. From the numerous constituents of pastures, from grain, and from the nuts of the tropics we have, condensed into meat, foodstuffs containing most of the important constituents essential for building up our bodies and maintaining vigour, such as proteins, fat, vitamins, minerals, &c.—From *The Farmer and Stockbreeder* (England).

Imports and Exports of Fruit.

The following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 30th September, 1929 :—

Description.	Imports.	Exports.
Interstate.		
	Cases.	Cases.
Fresh Fruit ...	443,877	66,990
Tomatoes ...	187,400	...
	lb.	lb.
Canned Fruit ..	48,860	1,288
Dried Fruits—		
Unspecified ...	11,914	672
Currants ..	3,864	280
Raisins ..	3,108	168
Apricots ...	938	...
Apples ...	924	..
Peaches ...	784	...
Pears	56	...
Prunes ...	1,344	476

Description.	Country of Origin.	Imports.	Exports.
Oversea.			
Fresh Fruits—		Centals.	Centals.
Apples ..	....	...	664
Bananas ...	....	2,084	...
Lemons ...	....	...	1,416
Oranges ..	....	...	8,220
Grape Fruit ...	....	...	13
Pears	....	...	346
Pineapples ...	....	...	1,790
Other	....	202	8,027
Dried Fruits—		lb.	lb.
Apples ...	....	...	898
Apricots ...	....	...	52,622
Currants ...	U.S.A.	40	51,744
Figs	Turkey	4,227	...
Prunes ...	U.S.A.	36,250	880
	France	320	...
Peaches ...	....	...	200
Raisins—			
Sultanas ...	U.S.A.	28,125	156,437
Lexias ...	....	...	2,632
Other ...	U.S.A.	87,788	1,376
Dates	Mesopotamia ...	2,580	19,735
Other —	China	7,213	675
	Turkey	1,904	...
Preserved in liquid—			
Apricots ...	....	...	57,256
Peaches ...	....	...	97,129
Pears ...	....	...	8,627
Pineapples ...	....	...	1,459
Raspberries	....	...	56,630
Other ...	....	...	18,683

Do You Know Your Weeds ?

If you were supplied with photographs of the thirty worst weeds in New South Wales, could you name each one with certainty? If not, then how can you intelligently apply the recommended control measures; or, if a strange plant makes its appearance, how can you be certain that it is not one of the worst weeds? Of course, it is always wise to treat every new plant with suspicion, but the farmer who knows the more important noxious weeds is best equipped for all emergencies.

To enable farmers to recognise the different noxious weeds with certainty, the Department of Agriculture is loaning to all papers in New South Wales blocks of the worst weeds, along with descriptive matter and control measures. Watch out for these illustrated articles in your local paper.

Orchard Notes.

DECEMBER.

C. G. SAVAGE and R. J. BENTON.

Some Seasonable Citrus Notes.

THE harvesting of citrus fruits is practically finished. In some localities small quantities of Late Valencia oranges and lemons may still remain to be harvested. These should realise high rates. The lemon market in particular appears likely to be good for a few months yet owing to frost having destroyed much of the young fruit during last winter.

Weather conditions during the spring months have been exceptionally favourable for fruit development, and care should be taken to prevent the fruit from over-growing. A medium-sized fruit sells best, especially while prices are high, so that when the fruit has reached a diameter of 2½ inches careful clipping is recommended, and, if the colour is green, storing for a few weeks to increase the juice content and decrease thickness of rind is advisable before marketing. In some cases, although the rind may not be over-thick and the juice content well up to requirements, the colour may be on the green side. In such cases artificial means may be resorted to for colouring the fruit. Ethylene gas is now used for this purpose by many growers who have sufficient fruit to justify the expense.

Cultivation.

In the majority of orchard soils suppression of weeds for the conservation of moisture will be essential. Thorough stirring of the soil to prevent the development of summer grass and other weeds, which in a season like the present grow rampantly, is desirable. In deep soils where moisture is retained for lengthy periods weed growth can be made use of to build up the organic content of the soil, but great discretion is necessary in this practice.

Irrigation.

The weather this month is usually hot and dry and if the soil moisture becomes greatly reduced, irrigation will be necessary. If young citrus fruits receive a severe check in their early development they fail to mature later and never reach the best packing sizes. At present an excellent setting of citrus fruits is evident, but many coastal orchards have difficulty in getting size into their fruit. Every care in assisting such trees should be taken by maintaining their vitality, which is mainly dependent on a sufficiency of soil moisture, adequate fertility, and freedom from pests.

Irrigation under inland conditions usually tends to produce rather large fruit, and this trouble is almost uncontrollable with young trees. Providing the conditions are favourable to the production of a good crop, irrigation should be practised as little as possible, particularly during the late summer and early autumn.

Fertilisers.

The coastal practice of applying fertiliser to orange trees in several applications usually provides for an amount to be given about January or February, which, as a rule, contains mostly phosphoric acid or a combination of phosphoric acid, potash and nitrogen, and often in a form which is very slowly available.

It appears very probable (and there are no experimental results to prove it otherwise) that much earlier applications of fertiliser would be more beneficial, and perhaps assist in developing size in the fruit.

In the case of oranges growers are strongly recommended to use more nitrogen and to apply it before it is obvious that the tree requires it. If trees have been well fertilised in early spring (August) it is believed that postponement of a further application should not be delayed any longer. Applications of a nitrogenous fertiliser, which is certainly the chief fertiliser needed by citrus trees, should not be delayed in most localities until February. Regarding lemon trees, which differ from orange trees in this respect, frequent applications are recommended for situations not subject to severe frosts. The main application of fertiliser should be given now, followed by a less amount in late summer. Lemons are mostly scarce during the summer and early autumn months, and fertilising should be adjusted so as to assist production during that period.

Control of Citrus Pests.

During this month white wax scale will be hatching, likewise red scale. Seasonal conditions cause a little variation in their development, but such scales are usually hatched out and are most vulnerable to spraying or fumigating during next month. Spray oils or fumigants should therefore be ordered in readiness, and spray pumps or fumigation sheets overhauled.

Fumigation carried out during the following month will prove effective against these pests, and is recommended for dense growing trees. Hydrocyanic acid gas is the fumigant used, and may be derived from potassium or sodium cyanide, sulphuric acid and water, or from one or other of the several proprietary calcium cyanides which are now on the market. The former method, known as the "pot" system, has up to date proved the most reliable exterminator of citrus scale pests, but experiments are still in progress to test out the more recently introduced compounds.

A leaflet giving the dosage tables is available free on application to the Department of Agriculture.

Where trees are not really dense, scale pests may be held in check by spraying. High pressure is necessary for best results. Various red spraying oils are on the market and more recently white oils of various brands have made their appearance, and while these are more costly they are to be preferred to the red oils.

Where white wax scale only has to be contended with, washing soda spray is most effective. Inquire for the free leaflet on this subject.

Pruning Citrus Trees.

Though pruning out of dead wood from tree centres may be done at any time of the year, the work is greatly facilitated if an open centred tree has been developed from the beginning. Therefore, in the case of young trees from two to three years old it is recommended that any vigorous shoots arising in or near the centre of the tree should be kept suppressed. In this way an upright habit of growth or production of a second story in a tree is avoided. If all strong shoots arising from within an imaginary circle of 15 inches diameter (the stem of the tree being the centre) are suppressed, a well-shaped tree will be produced. Light growths should not be removed from this area as they provide shade for the tree's crown.

Order Citrus Trees Now.

Any citrus trees required should be ordered now, as by doing so growers assist the nurserymen, who are able to judge from the nature of the orders just what to bud. Early orders usually have the best trees reserved for them. Planting of trees should be done along a well studied plan and should not be influenced only by the immediate demands of the market.

Codling Moth.

Early in December the tiny grubs of the codling moth are often to be noticed mining their way into apples and pears in the tableland districts. While the lead arsenate spray will account for many of these, a systematic hand picking of infested fruit is well worth while.

With further reference to this pest, growers are reminded of the requirements of the Plant Diseases Act, which sets out that the third spraying must be completed by 11th December, and the fourth spraying commenced four weeks from the commencement of the third spraying and completed by 8th January. Other requirements in regard to bandaging, destruction of infested fruit, &c., are very plainly set out in Insect Pest Leaflet No. 9 (Codling Moth), obtainable free of charge from the Department of Agriculture.

Pear and Cherry Slug.

Growers were reminded last month to be on the lookout for this pest, which is easy to control, but capable of doing a considerable amount of damage if neglected. The lead arsenate spray recommended is made by mixing 1 lb. lead arsenate powder in 40 gallons of water. In the case of pears the spraying given for codling moth will also be beneficial in checking the slug, though it is often necessary, both in the case of cherries and pears, to give a further spraying before getting the slugs under control.

Rutherglen Bug.

The rutherglen bug often proves a serious pest of summer fruits, particularly stone fruits, during midsummer. As this pest breeds in the grass or herbage, clean cultivation of the orchard must appeal as the first step in preventing it from gaining a hold. And it is very important that preventive rather than eradicative measures should be adopted, as the rutherglen bug is very difficult to destroy. Contact sprays, dusting with lime dust, and

smudging are some of the methods employed to check the pest. Write to the Department for a copy of the leaflet giving details.

Canning and Bottling.

Many housewives look forward to this season of the year to re-stock the larder with preserves, jams, pickles, &c. To meet inquiries on these subjects the Department of Agriculture has prepared a number of free leaflets, and will welcome applications from those interested.

Picking Stone Fruits.

A good proportion of the year's profits is often lost through careless picking, grading, and packing. Pick the fruit while firm, but make certain that it has reached that stage of maturity which will allow of the continuance of the natural ripening processes after picking. If the fruit is on the green side when harvested it will shrivel during transit and will prove hard to dispose of. And the position will not be improved if the fruit is over-ripe when picked. As all the fruit does not mature simultaneously, it means that the trees will have to be picked over a number of times in order to have the fruit at proper stage of maturity when packed.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney, not later than the 12th of the month.

Maize—

Fitzroy ...	Manager, Experiment Farm, Grafton.
Leaming ...	Manager, Experiment Farm, Grafton.

Sorghum—

Collier ...	Under Secretary, Dept. of Agriculture, Box 36A, G.P.O., Sydney.
Feterita ...	Under Secretary, Dept. of Agriculture, Box 36A, G.P.O., Sydney.
Saccaline ...	Under Secretary, Dept. of Agriculture, Box 36A, G.P.O., Sydney.
	Mr. A. S. Pankhurst, William Street, Singleton.
Sumac ...	Manager, Experiment Farm, Bathurst.
	Under Secretary, Dept. of Agriculture, Box 36A, G.P.O., Sydney.
White African	Under Secretary, Dept. of Agriculture, Box 36A, G.P.O., Sydney.
	Principal, Hawkesbury Agricultural College, Richmond.

Broom Millet—

Manager, Experiment Farm, Coonamble.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Poultry Notes.

December.

E. HADLINGTON, Poultry Expert.

During this month attention should be directed towards culling out the unprofitable units in the flocks. To what extent culling of second-year hens may be necessary will depend upon how the birds are laying and other circumstances such as whether the pens they are occupying are required for other birds, or if there is any overcrowding, which, with the advent of warmer weather, would result in the birds breaking into a moult.

The fact must not be overlooked that many hens cease laying temporarily after the flush period of production and due allowance must be made for these, because unless they break into a moult they will often come on to lay again and continue for several months. If a 50 per cent. egg production is being obtained from the second-year hens it will be found that there is not much scope for heavy culling, but, on the other hand, if production has fallen permanently much below the level indicated and there are signs of breaking into moult, then the offenders should be culled. In view of the present high cost of foodstuffs it is uneconomical to hold second-year birds which have ceased to lay, and for that matter first-year hens which break into moult during this month are not likely to be profitable to retain, because usually they do not come on again before the later moulters.

Points in Culling.

The problem which confronts most beginners is how to discriminate between the birds which should be culled and those which it will be profitable to hold. That many make mistakes is evident from the number of hens seen in the markets which would have continued to lay.

The procedure which should be adopted at culling time is, first of all, to keep a record over a week or more of the eggs laid by each pen of hens, and if during December production is much less than 50 per cent. the pens should be gone through carefully to pick out those birds which on outward appearances look as if they are not laying. The chief indications are a dullness about the head; comb and wattles beginning to contract, showing a somewhat dry appearance similar to a wilted plant, and in some cases a moult commencing.

After making a selection on outward appearances it is advisable to confirm this by feeling the pelvic bones, which, in birds that have ceased to lay will be quite close together, in fact almost touching, and the whole abdomen will be contracted. In dealing with the heavy breeds allowance has to be made for hens which may have been broody, as these will appear the same as described above. Therefore, the safest course for the beginner is to pick out those which it is thought should go to market and put them in a pen for a week or so to see if any come on to lay again, or show signs of freshening up to lay.

It may also be necessary to eliminate some of the hens which are becoming coarse and heavy and are not likely to pay to keep, such as hens which have developed overhanging eyebrows, thick skulls, and wrinkled faces, which characteristics are usually accompanied by coarseness of bone and a general lazy appearance. Such birds should be rejected from both first- and second-year flocks.

Culling Pullets.

The question, "How should I cull the pullets?" is often asked by poultry farmers of limited experience and the common idea is that a rigid culling should be carried out, but where the pullets have been well reared there should not be any necessity for wholesale elimination. The only culling that should be required is of odd birds which show pronounced deformities, lack of development, and perhaps a limited number on account of coarseness. No attempt, however, should be made to select pullets by pelvic bone measurements because there are so many individual variations and factors to take into consideration that even the most experienced would be likely to make mistakes. What is often overlooked in this connection is that only those birds which are in full laying condition will be found to conform to any such measurement tests.

Even if such systems were reliable for selecting the layers, the fact that the laying of pullets fluctuates so much would render it unwise to attempt culling by such means. This applies particularly to leghorns, which are subject to a partial moult early in the year, the approach of which causes a general contraction of the abdomen, and often birds which were in "full bloom" only a week or so before may later appear only fit subjects for market. Therefore, the rule should be to reject only the obviously poor specimens and to do so before any breaking up occurs.

Management of Layers.

On many farms the faulty management of layers results in numbers of hens breaking into moult much earlier than should be the case, thus necessitating early culling, and also causing the pullets to break up more so than would otherwise happen. The chief factors contributing towards this result are sudden changes in feeding, unskilful methods or irregular hours of feeding, crowding too many birds into the houses, or having the perches too close together, and low, badly-ventilated, or otherwise unsuitable houses.

With regard to feeding it should be understood that while the birds are not so susceptible to changes in the food or methods of feeding during the flush period of laying, this is not so later on, and at this time of the year it becomes a matter of care and skill in feeding to obtain the best results, and any changes which it is desired to make should be very gradual. The same applies to pullets which are just commencing to lay, but more so a month or so hence, when any changes may bring about a partial moult and consequent loss of production for several weeks.

Next comes the question of housing. It is a common practice to increase the number of hens in the flocks in order to make room for the young stock coming along, and where this causes overcrowding the effect will soon

be noticed in a reduced egg production, more particularly after a spell of warm weather. If the perches are too close, which is frequently the case on account of extra roosts being put in to accommodate the hens, the trouble is accentuated. In this connection it is not safe to have the perches less than 20 inches apart and if the houses are very deep 24 inches should be allowed. Anything which results in a stuffy or sweltering condition will cause a falling off in production and lead to an early moult.

It is a good plan to make an inspection of the birds on a hot night a few hours after they have gone to roost for the purpose of seeing if they are comfortable. Where the conditions are not good the birds will be found to pant heavily and show signs of distress, and an unpleasant odour will be noticed.

Heat Waves.

The cool weather experienced so far this season may lead many to think that heat waves are unlikely, and consequently poultry farmers are liable to be caught unawares by a hot spell and suffer heavy losses. Last year when such heavy toll was taken of poultry flocks, those who suffered most were the ones who were absent from their farms. Many poultry farmers, in telling of their losses, stated that they had gone away in the morning and returned during the afternoon to find hundreds of birds dead. Doubtless they will not be caught again, but others who have not had the experience may be lulled into a sense of security by the unusually cool spring and consequently not be on the alert for heat waves.

The only safe practice is to remain on the farm as much as possible when the temperature begins to soar, or leave someone in charge with full instructions as to how to handle the situation in case of trouble.

It can be taken as a general rule that when the mercury goes above 100 degrees Fah. the birds will require watching to prevent loss. Regular rounds of the farm should be made each hour to see that the birds are not suffering, and to prevent their packing into nests or corners in an attempt to find a cool place, as this only makes matters worse. The first indication of trouble is that affected birds will not move about when disturbed, and are greatly distressed. Such birds should be taken out and have their heads held under a water tap or dipped in a vessel of water, at the same time wetting under the wings. They may then be placed in the coolest spot available, preferably where there is a draught. If the ground is wetted it will keep them cooler. Several applications of water may be necessary before the birds recover.

It is not advisable to saturate the birds with water as this is likely to cause a chill later; nor should water be thrown into the houses, especially on a day when there is no wind, as this will only cause increased humidity. There is no harm, however, in wetting the ground in the shade of trees or near the houses, but it will be found that if the houses are reasonably large and well ventilated they will be cooler in them than in the shade of trees; therefore, on no account should the birds be shut out of the houses on a hot day.

During the hot days it is necessary to study the appetites of the birds and feed accordingly, and when a heat wave is likely it is advisable to reduce the usual morning mash and also the evening feed, probably for a few days. This will materially assist in preventing losses, because, when the birds have a heavy feed of mash and drink a lot of water, digestive troubles arise and tend to increase the rate of mortality.

It should be realised that most of the losses during a heat wave are preventable if due precautions are taken, and poultry farmers in their own interests, therefore, should give more attention to this matter in order to prevent the very heavy losses which usually occur on exceptionally hot days.

TUBERCLE-FREE HERDS.

OF the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number tested.	Expiry date of this Certification.
Kyong School, Moss Vale	2	21 Nov., 1929
W. McLean, Unanderra	44	1 Dec., 1929
Department of Education, Brush Farm, Eastwood	8	5 ,, 1929
Lunacy Department, Morisset Mental Hospital	21	7 ,, 1929
J. Davies, Puen Buen, Scone (Jerseys)	39	12 ,, 1929
Kinross Bros., Minnamurra, Inverell (Guernseys)	73	14 ,, 1929
Lunacy Department, Callan Park Mental Hospital	22	19 ,, 1929
Miss Brennan, Arrankamp, Bowral	14	20 ,, 1929
E. S. Cameron, Big Plain, Narrandera	39	10 Jan., 1930
Lunacy Department, Rydalmere Mental Hospital	68	11 ,, 1930
G. A. Parrish, Jerseyland, Berry	77	12 ,, 1930
New England Girls' Grammar School, Armidale	28	16 ,, 1930
G. Miller, Casula	15	1 Feb., 1930
Queanbeyan Municipality (various owners)	41	1 ,, 1930
St. Joseph's Convent, Reynold-street, Goulburn	5	19 ,, 1930
St. John's Boys Orphanage, Goulburn	9	19 ,, 1930
St. Michael's Novitiate, Goulburn	5	20 ,, 1930
Department of Education, Yanco Agricultural High School	32	23 ,, 1930
Lunacy Department, Kenmore Mental Hospital	81	28 ,, 1930
St. Joseph's Girls' Orphanage, Kenmore	9	1 Mar., 1930
Tudor House School, Moss Vale	8	6 ,, 1930
Department of Education, Hurlstone Agricultural High School	42	10 April, 1930
Navua Ltd., Grose Wold, via Richmond (Jerseys)	10	11 ,, 1930
Australian Missionary College, Cooranbong	43	17 ,, 1930
Department of Education, Gosford Farm Homes	37	24 May, 1930
William Thompson, Masonic School, Baulkham Hills	27	24 ,, 1930
F. W. Hopley, Leeton	29	29 ,, 1930
J. F. Chaffey, Glen Innes (Ayrshires)	56	29 ,, 1930
P. Ubrihien, Corridgeree, Bega	119	8 June, 1930
E. P. Perry, Nundorah, Parkville (Guernseys)	28	14 ,, 1930
Sacred Heart Convent, Bowral	11	17 July 1930
Marion Hill Convent of Mercy, Goulburn	12	19 ,, 1930
A. Shaw, Barrington (Milking Shorthorns)	104	2 Aug., 1930
St. Patrick's College, Goulburn	9	7 ,, 1930
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	52	17 ,, 1930
Mittagong Farm Homes, Mittagong	35	30 ,, 1930
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	78	4 Sept., 1930
James McCormick, Tumut	94	5 ,, 1930
Walaroi College, Orange	8	19 ,, 1930
Riverstone Meat Co., Riverstone Meat Works, Riverstone	115	27 ,, 1930
J. L. W. Barton, Wallerawang	18	9 Oct., 1930
Blessed Chanel's Seminary, Mittagong	5	25 ,, 1930
N. A. Corderoy, Wyuna Park, Comboyne	54	1 Nov., 1930
S. G. Winkley	85	8 ,, 1930

—MAX HENRY, Chief Veterinary Surgeon.

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